

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1

```
0001 | !First version AL October 201
0002
0003 !Calculates local fnl and CMB
0004 !CMB lensing bispectra are ca
0005 !result is used replacing the
0006 !This is non-perturbatively c
0007 !Note the lensing bispectrum
0008 !See Lewis, Challinor & Hanso
0009
0010 !Note that the primordial loc
0011
0012 !Compile with LAPACK and -DFI
0013 !This is disabled by default
0014
0015 !Fisher results are with and
0016
0017 module Bispectrum
0018   use ModelParams
0019   use ModelData
0020   use InitialPower
0021   use SpherBessels
0022   use IniFile
0023   implicit none
0024
0025     integer, parameter :: max_
0026
0027     Type TBispectrumParams
0028       logical do_lensing_bispe
0029       logical do_primordial_bi
0030       integer nfields
```

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```
0001 | !First version AL October
0002
0003 !Calculates local fnl and CMB
0004 !CMB lensing bispectra ar
0005 !result is used replacing
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0007 !Note the lensing bispect
0008 !See Lewis, Challinor & H
0009
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0011
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0016
0017 module Bispectrum
0018   use ModelParams
0019   use ModelData
0020   use InitialPower
0021   use SpherBessels
0022   use IniFile
0023   implicit none
0024
0025     integer, parameter :: max_
0026
0027     Type TBispectrumParams
0028       logical do_lensing_bispe
0029       logical do_primordial.bi
0030       integer nfields
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 31

```
0031      integer Slice_Base_L, nd
0032      logical do_parity_odd
0033      logical DoFisher
0034      logical export_alpha_bet
0035      real(dl) FisherNoise, Fi
0036      character(LEN=Ini_max_st)
0037      logical SparseFullOutput
0038 end Type
0039
0040      !global parameter for now
0041      Type(TBispectrumParams)
0042
0043      Type TBispectrum
0044          real(dl), pointer :: b(
0045      end Type
0046      Type TCov
0047          real(dl), pointer :: C(
0048      end type TCov
0049
0050      Type TCov2
0051          real(dl) :: C(2,2)
0052      end type TCov2
0053
0054      Type TCov3
0055          real(dl) :: C(3,3)
0056      end type TCov3
0057
0058      real(dl), allocatable :: d
0059      real(dl), parameter :: Int
0060      character(LEN=1024) :: out
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 31

```
0031      integer Slice_Base_L,
0032      logical do_parity_odd
0033      logical DoFisher
0034      logical export_alpha_bet
0035      real(dl) FisherNoise,
0036      character(LEN=Ini_max_st)
0037      logical SparseFullOutput
0038 end Type
0039
0040      !global parameter for now
0041      Type(TBispectrumParams)
0042
0043      Type TBispectrum
0044          real(dl), pointer :: b(
0045      end Type
0046      Type TCov
0047          real(dl), pointer :: C(
0048      end type TCov
0049
0050      Type TCov2
0051          real(dl) :: C(2,2)
0052      end type TCov2
0053
0054      Type TCov3
0055          real(dl) :: C(3,3)
0056      end type TCov3
0057
0058      real(dl), allocatable :: d
0059      real(dl), parameter :: Int
0060      character(LEN=1024) :: out
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 61

```
0061      integer, parameter :: shap
0062      integer, parameter :: shap
0063
0064      real(dl), allocatable :: T
0065      contains
0066
0067      subroutine InitBessel
0068      ! j_l' array for int
0069      Type(ClTransferData)
0070      integer i,l1,j
0071      real(dl) Jm, Jp
0072
0073      if (allocated(dJl))
0074          deallocate(dJL, d
0075      end if
0076      allocate(dJl(BessR
0077
0078      do i=1, CTrans%ls%
0079      !Spline agrees wel
0080      ! call spline_der
0081      ! call spline(Bes
0082
0083      l1 = CTrans%ls%1
0084      do j=1, BessRang
0085          call BJL(l1-1,B
0086          call BJL(l1+1,B
0087          dJl(j,i)= ( l1
0088          end do
0089          call spline(BessR
0090
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 61

```
0061      integer, parameter :: sha
0062      integer, parameter :: sha
0063
0064      real(dl), allocatable :: T
0065      contains
0066
0067      subroutine InitBesselDeri
0068      ! j_l' array for interpol
0069      Type(ClTransferData) :: C
0070      integer i,l1,j
0071      real(dl) Jm, Jp
0072
0073      if (allocated(dJl)) then
0074          deallocate(dJL, dddJl
0075      end if
0076      allocate(dJl(BessRanges%n
0077
0078      do i=1, CTrans%ls%10
0079      !Spline agrees well
0080      ! call spline_deriv(
0081      ! call spline(BessRa
0082
0083      l1 = CTrans%ls%1(i)
0084      do j=1, BessRanges%np
0085          call BJL(l1-1,Bes
0086          call BJL(l1+1,Bes
0087          dJl(j,i)= ( l1*B
0088          end do
0089          call spline(BessRange
0090
```

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```
0091      end do  
0092  
0093      end subroutine InitBe  
0094  
0095      subroutine NonGauss_l_r_  
0096          !functions of the fo  
0097          !ind and indP are ar  
0098          !res and resP are th  
0099          Type(ClTransferData  
0100          integer, intent(in)  
0101          integer :: nfields  
0102          real(dl) res(CTrans  
0103          real(dl), intent(in  
0104          integer q_ix, j, be  
0105          integer n, nP, ellm  
0106          real(dl) xf , J_l,  
0107  
0108          n = size(ind)  
0109          nP =size(indP)  
0110          res=0  
0111          resP = 0  
0112          do q_ix = 1, CTrans  
0113              k = CTrans%q%poin  
0114              xf = k*r  
0115              bes_ix=Ranges_ind  
0116              fac=BessRanges%po  
0117              a2=(BessRanges%po  
0118              fac=fac**2*a2/6  
0119              dlnk = CTrans%q%d  
0120              P = ScalarPower(k
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 91

```
0091      end do  
0092  
0093      end subroutine InitBessel  
0094  
0095      subroutine NonGauss_l_r_l  
0096          !functions of the form in  
0097          !ind and indP are arrays  
0098          !res and resP are the res  
0099          Type(ClTransferData) :: C  
0100          integer, intent(in) :: in  
0101          integer :: nfields  
0102          real(dl) res(CTrans%ls%10  
0103          real(dl), intent(in) :: r  
0104          integer q_ix, j, bes_ix  
0105          integer n, nP, ellmax  
0106          real(dl) xf , J_l, fac, a  
0107  
0108          n = size(ind)  
0109          nP =size(indP)  
0110          res=0  
0111          resP = 0  
0112          do q_ix = 1, CTrans%q%npo  
0113              k = CTrans%q%points(q  
0114              xf = k*r  
0115              bes_ix=Ranges_indexOf  
0116              fac=BessRanges%points  
0117              a2=(BessRanges%points  
0118              fac=fac**2*a2/6  
0119              dlnk = CTrans%q%dpoint  
0120              P = ScalarPower(k, 1)
```

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```
0121  
0122      ellmax = max(xf/(  
0123      kpow = k**ind(1  
0124      kpowP = k**indP(1  
0125      do j=1,CTrans%ls%  
0126          if (CTrans%ls%1(  
0127              J_1=a2*ajl(bes  
0128                  *ajl  
0129              term = CTrans%D  
0130              res(j,1,1) = re  
0131              resP(j,1,1) = r  
0132              if (nfields>1)  
0133                  !E pol  
0134                  term = CTra  
0135                  res(j,1,2)  
0136                  resP(j,1,2)  
0137                  if (nfields  
0138                      !lensing po  
0139                      term = CTra  
0140                      res(j,1,3)  
0141                      resP(j,1,3)  
0142                      end if  
0143                  end if  
0144  
0145          end if  
0146      end do  
0147  end do  
0148  resP = resP * fourpi  
0149  res = res * 2/pi  
0150
```

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```
0121  
0122      ellmax = max(xf/(1-xl  
0123      kpow = k**ind(1)+3  
0124      kpowP = k**indP(1) *  
0125      do j=1,CTrans%ls%10  
0126          if (CTrans%ls%1(j  
0127              J_1=a2*ajl(be  
0128                  *ajlpr(be  
0129              term = CTrans  
0130              res(j,1,1) =  
0131              resP(j,1,1) =  
0132              if (nfields>1)  
0133                  !E pol  
0134                  term = CT  
0135                  res(j,1,2)  
0136                  resP(j,1,  
0137                  if (nfiel  
0138                      !lens  
0139                      term  
0140                      res(j  
0141                      resP(  
0142                      end if  
0143                  end if  
0144  
0145          end if  
0146      end do  
0147  end do  
0148  resP = resP * fourpi  
0149  res = res * 2/pi  
0150
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 151

```
0151      end subroutine NonGau
0152
0153      subroutine NonGauss_1
0154      !functions of the fo
0155      !nd and indP are ar
0156      !res and resP are th
0157      !Output of P scaled
0158      Type(CLTransferData)
0159      integer:: nfields
0160      integer, intent(in)
0161      real(dl) res(CTrans
0162      real(dl), intent(in
0163      integer q_ix, j, be
0164      integer n, nP, ellm
0165      real(dl) xf , J_l,
0166
0167      if (shape == shape_
0168          call NonGauss_1_r
0169          return
0170      end if
0171
0172      n = size(ind)
0173      nP =size(indP)
0174      res=0
0175      resP = 0
0176      do q_ix = 1, CTrans
0177          k = CTrans%q%poin
0178          xf = k*r
0179          bes_ix=Ranges_ind
0180          fac=BessRanges%po
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 151

```
0151      end subroutine NonGauss_1
0152
0153      subroutine NonGauss_1_r(C
0154      !functions of the form in
0155      !nd and indP are arrays
0156      !res and resP are the res
0157      !Output of P scaled by 1d
0158      Type(CLTransferData) :: C
0159      integer:: nfields
0160      integer, intent(in) :: in
0161      real(dl) res(CTrans%ls%10
0162      real(dl), intent(in) :: r
0163      integer q_ix, j, bes_ix,
0164      integer n, nP, ellmax
0165      real(dl) xf , J_l, fac, a
0166
0167      if (shape == shape_local)
0168          call NonGauss_1_r_loc
0169          return
0170      end if
0171
0172      n = size(ind)
0173      nP =size(indP)
0174      res=0
0175      resP = 0
0176      do q_ix = 1, CTrans%q%npo
0177          k = CTrans%q%points(q
0178          xf = k*r
0179          bes_ix=Ranges_indexOf
0180          fac=BessRanges%points
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 181

```
0181          a2=(BessRanges%po  
0182          fac=fac**2*a2/6  
0183          dlnk = CTrans%q%d  
0184          P = ScalarPower(k  
0185  
0186          ellmax = max(xf/(  
0187          do i=1,n  
0188              kpow(i)=k** (ind  
0189          end do  
0190          do i=1,nP  
0191              kpow2(i)=k**ind  
0192          end do  
0193  
0194          do j=1,CTrans%ls%  
0195              if (CTrans%ls%l(  
0196  
0197                  J_l=a2*ajl(bes  
0198                      *ajl  
0199                      !call BJL(CTran  
0200                      term = CTrans%D  
0201                      do i=1,n  
0202                          res(j,i,1) = r  
0203                      end do  
0204                      do i=1,nP  
0205                          resP(j,i,1) =  
0206                      end do  
0207                      if (CTrans%ls%  
0208                          k, xf, real(t  
0209                          real(res(j,1)  
0210                          if (nfields>1)
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 181

```
0181          a2=(BessRanges%points  
0182          fac=fac**2*a2/6  
0183          dlnk = CTrans%q%dpoints  
0184          P = ScalarPower(k, 1  
0185  
0186          ellmax = max(xf/(1-xl  
0187          do i=1,n  
0188              kpow(i)=k** (ind(i  
0189          end do  
0190          do i=1,nP  
0191              kpow2(i)=k**indP(  
0192          end do  
0193  
0194          do j=1,CTrans%ls%10  
0195              if (CTrans%ls%l(j  
0196  
0197                  J_l=a2*ajl(be  
0198                      *ajlpr(be  
0199                      !call BJL(CTr  
0200                      term = CTrans  
0201                      do i=1,n  
0202                          res(j,i,1  
0203                      end do  
0204                      do i=1,nP  
0205                          resP(j,i,  
0206                      end do  
0207                      !          if (CTr  
0208                          !          k, xf,  
0209                          !          real(r  
0210                          if (nfields>1)
```

```
/Users/lp1opa/Compare/camb_simdata/SeparableBispectrum.F90, Top line: 211
```

```
0211      !E pol  
0212      term = CTra  
0213      do i=1,n  
0214          res(j,i,2)  
0215      end do  
0216      do i=1,nP  
0217          resp(j,i,2)  
0218      end do  
0219      if (nfields  
0220          !lensing po  
0221          term = CTra  
0222          do i=1,  
0223              res(j,  
0224          end do  
0225          do i=1,  
0226              resp(j  
0227          end do  
0228          end if  
0229      end if  
0230  
0231          end if  
0232      end do  
0233  end do  
0234  resp = resp * fourpi  
0235  res = res * 2/pi  
0236  
0237  end subroutine NonGau  
0238  
0239  
0240  subroutine GetBispect
```

```
/Users/lp1opa/Compare/camb_des/SeparableBispectrum.F90, Top line: 211
```

```
0211      !E pol  
0212      term = CT  
0213      do i=1,n  
0214          res(j  
0215      end do  
0216      do i=1,nP  
0217          resp(j  
0218      end do  
0219      if (nfiel  
0220          !lens  
0221          term = CT  
0222          do i=1,  
0223              res(j,  
0224          end do  
0225          do i=1,  
0226              resp(j  
0227          end do  
0228          end if  
0229      end if  
0230  
0231          end if  
0232      end do  
0233  end do  
0234  resp = resp * fourpi  
0235  res = res * 2/pi  
0236  
0237  end subroutine NonGauss_1  
0238  
0239  
0240  subroutine GetBispectrum(
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 241

```
0241          !Note: may need high  
0242          !for accurate alpha(  
0243          !increase accuracy_b  
0244          use lensing  
0245          use lvalues  
0246          use constants  
0247          use Ranges  
0248 #ifdef FISHER  
0249          use MatrixUtils  
0250 #endif  
0251          integer, parameter  
0252          Type(ClTransferData)  
0253          Type(Regions) :: Ti  
0254          integer, allocatable ::  
0255          real(dl), allocatable ::  
0256          real(dl), allocatable ::  
0257          real(dl) r, term  
0258          Type(TBispectrum),  
0259          !TTT, TTE, etc; 1  
0260          !OddBispectra are  
0261          Type(TBispectrum),  
0262          !For use in Fis  
0263          real(dl) test(lmin:  
0264          integer i, j, 11,12  
0265          integer min_1, max_1  
0266          real(dl) tmp, tmp1,  
0267          real(dl) a3j(0:CTra  
0268          real(dl) a3j2(0:CTR  
0269          real(dl) CLForLensi  
0270          Type(lSamples) :: S
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 241

```
0241          !Note: may need high maxe  
0242          !for accurate alpha(r), b  
0243          !increase accuracy_boost  
0244          use lensing  
0245          use lvalues  
0246          use constants  
0247          use Ranges  
0248 #ifdef FISHER  
0249          use MatrixUtils  
0250 #endif  
0251          integer, parameter :: max  
0252          Type(ClTransferData) :: C  
0253          Type(Regions) :: TimeStep  
0254          integer, allocatable ::  
0255          real(dl), allocatable ::  
0256          real(dl), allocatable ::  
0257          real(dl) r, term  
0258          Type(TBispectrum), target  
0259          !TTT, TTE, etc; last inde  
0260          !OddBispectra are parity  
0261          Type(TBispectrum), pointe  
0262          !For use in Fisher approx  
0263          real(dl) test(lmin:CTrans  
0264          integer i, j, 11,12,13, i  
0265          integer min_1, max_1, 1ma  
0266          real(dl) tmp, tmp1, tmp2,  
0267          real(dl) a3j(0:CTrans%ls%  
0268          real(dl) a3j2(0:CTrans%ls%  
0269          real(dl) CLForLensingIn(4  
0270          Type(lSamples) :: SampleL
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 271

```
0271      real starttime  
0272      real(dl) Bscale  
0273      integer field, field  
0274      Type(TCov2), allocatable  
0275      integer nfields, nb  
0276      integer :: fnl_bisp  
0277      integer :: lens_bis  
0278      character(LEN=256)  
0279      integer idelta, fileid  
0280      character(LEN=26) ::  
0281      integer :: parities  
0282      integer, parameter  
        !assume C^{T\psi}  
0283      integer, parameter  
0284  
0285  
0286      integer, parameter  
0287      integer, parameter  
0288 #ifdef FISHER  
0289      Type(TBispectrum), pointer  
0290      real(dl) Cl(4,lmin:  
0291      real(dl) a3j_00(0:  
0292      integer lstart  
0293      real(dl) Noise, NoiseP,  
0294      real(dl), allocatable  
0295      real(dl) fish_contr  
0296      real(dl), allocatable  
0297      real(dl), allocatable  
0298      Type(TBispectrum),  
0299      real(dl) sigma2, xl  
0300
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 271

```
0271      real starttime  
0272      real(dl) Bscale  
0273      integer field, field1, fie  
0274      Type(TCov2), allocatable  
0275      integer nfields, nbispect  
0276      integer :: fnl_bispectrum  
0277      integer :: lens_bispectrum  
0278      character(LEN=256) :: fi  
0279      integer idelta, fileid  
0280      character(LEN=26) :: Bisp  
0281      integer :: parities(3), o  
0282      integer, parameter :: lma  
        !assume C^{T\psi} zero ab  
0283      integer, parameter :: lma  
0284  
0285  
0286      integer, parameter :: fir  
0287      integer, parameter :: len  
0288 #ifdef FISHER  
0289      Type(TBispectrum), pointer  
0290      real(dl) Cl(4,lmin:CTrans  
0291      real(dl) a3j_00(0:CTrans  
0292      integer lstart  
0293      real(dl) Noise, NoiseP, b  
0294      real(dl), allocatable:: f  
0295      real(dl) fish_contribs_si  
0296      real(dl), allocatable ::  
0297      real(dl), allocatable ::  
0298      real(dl), allocatable ::  
0299      Type(TBispectrum), target  
0300      real(dl) sigma2, xlc, tmp
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 301

```
0301      integer f1,f2,f3,  
0302      integer sz,corrsize  
0303      Type(TCov), allocat  
0304      integer ix1,ix2  
0305      real(dl) tmpArr(lmi  
0306      #endif  
0307  
0308      parities(1)=1 !T  
0309      parities(2)=1 !E  
0310      parities(3)=-1 !B  
0311  
0312  
0313      if (BispectrumParam  
0314          fnl_bispectrum_ix  
0315          nbispectra=1  
0316          BispectrumNames(fnl_  
0317      else  
0318          fnl_bispectrum_ix  
0319          nbispectra=0  
0320          end if  
0321          if (BispectrumParam  
0322              lens_bispectrum_ix  
0323              nbispectra=nbispec  
0324              BispectrumNames(lens_  
0325          end if  
0326          if (nbispectra>max_<  
0327              if (CP%InitPower%nn  
0328                  nfields=BispectrumP  
0329  
0330
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 301

```
0301      integer f1,f2,f3, min12,  
0302      integer sz,corrsize  
0303      Type(TCov), allocatable :  
0304      integer ix1,ix2  
0305      real(dl) tmpArr(lmin:CTra  
0306      #endif  
0307  
0308      parities(1)=1 !T  
0309      parities(2)=1 !E  
0310      parities(3)=-1 !B  
0311  
0312  
0313      if (BispectrumParams%do_p  
0314          fnl_bispectrum_ix = 1  
0315          nbispectra=1  
0316          BispectrumNames(fnl_b  
0317      else  
0318          fnl_bispectrum_ix = 0  
0319          nbispectra=0  
0320          end if  
0321          if (BispectrumParams%do_l  
0322              lens_bispectrum_ix =  
0323              nbispectra=nbispectra  
0324              BispectrumNames(lens_<  
0325          end if  
0326          if (nbispectra>max_bispec  
0327  
0328          if (CP%InitPower%nn>1) ca  
0329  
0330      nfields=BispectrumParams%
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 331

```
0331  
0332      if (lSampleBoost <5  
0333          if (lens_bispectrum  
0334              lmax = CTrans%ls%l(  
0335                  if (CP%DoLensing) l  
0336                      SampleL%10=0  
0337                      l1=1  
0338                      do  
0339                          if (l1<=lmax_lens  
0340                              l1 = l1+1  
0341                          else if (l1<120)  
0342                              l1 =l1+nint(7/Ac  
0343                          else  
0344                              l1 =l1+nint(50/A  
0345                          end if  
0346                          if (l1>lmax) then  
0347                              l1 =lmax  
0348                          end if  
0349                          if (BispectrumPar  
0350                              !Make sure requ  
0351                              if ( Bispectrum  
0352                                  SampleL%10= S  
0353                                  SampleL%l(Sam  
0354                                  end if  
0355                                  end if  
0356                                  SampleL%10= Sampl  
0357                                  ! print *,l1  
0358                                  SampleL%l(SampleL  
0359  
0360
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 331

```
0331  
0332      if (lSampleBoost <50) cal  
0333          if (lens_bispectrum_appro  
0334              lmax = CTrans%ls%l(CTrans  
0335                  if (CP%DoLensing) lmax =  
0336                      SampleL%10=0  
0337                      l1=1  
0338                      do  
0339                          if (l1<=lmax_lensing_  
0340                              l1 = l1+1  
0341                          else if (l1<120) then  
0342                              l1 =l1+nint(7/Acc  
0343                          else  
0344                              l1 =l1+nint(50/Ac  
0345                          end if  
0346                          if (l1>lmax) then  
0347                              l1 =lmax  
0348                          end if  
0349                          if (BispectrumParams%  
0350                              !Make sure requ  
0351                              if ( BispectrumPa  
0352                                  SampleL%10= S  
0353                                  SampleL%l(Sam  
0354                                  end if  
0355                                  end if  
0356                                  SampleL%10= Sampl  
0357                                  ! print *,l1  
0358                                  SampleL%l(SampleL  
0359  
0360
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 361

```
0361      if (l1 == lmax) exit  
0362      end do  
  
0363      allocate(Bispectra(  
0364      do field1=1,nfields  
0365          do field2=1,nfie  
0366              do field3=1  
0367                  !Only sto  
0368                  do bispec  
0369                      allocate(  
0370                          Bispectra  
0371                      end do  
0372                  end do  
0373          end do  
0374      end do  
0375      end do  
  
0376      if (BispectrumParam  
0377          if (.not. CP%Do  
0378              print *, 'Getting lens  
0379          allocate(CForLe  
0380  
0381          CPhi=0  
0382          do i=lmin,lmax  
0383              CPhi(1,i) =  
0384                  !set correla  
0385                  if (i<=lmax_  
0386                      CPhi(2,i) =  
0387                  end if  
0388  
0389  
0390
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 361

```
0361      if (l1 == lmax) exit  
0362      end do  
  
0363      allocate(Bispectra(nfield  
0364      do field1=1,nfields  
0365          do field2=1,nfields  
0366              do field3=1,nfiel  
0367                  !Only store 1  
0368                  do bispectrum  
0369                      allocate(  
0370                          Bispectra  
0371                      end do  
0372                  end do  
0373          end do  
0374      end do  
0375      end do  
  
0376      if (BispectrumParams%do_l  
0377          if (.not. CP%DoLensi  
0378              print *, 'Getting lens  
0379          allocate(CForLensing(  
0380  
0381          CPhi=0  
0382          do i=lmin,lmax  
0383              CPhi(1,i) = Cl_sc  
0384                  !set correlations  
0385                  if (i<=lmax_lensi  
0386                      CPhi(2,i) = C  
0387                  end if  
0388  
0389  
0390
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 391

```
0391          if (i<=lmax_
0392              CPhi(3,i) =
0393      end if
0394      tmp = i*(i+1)
0395      CLForLensing
0396      ! CForLensing
0397      CForLensing(
0398      CForLensing(
0399      CForLensing(
0400      CForLensing(
0401      ! CForLensing
0402  end do
0403
0404 #ifdef FISHER
0405     allocate(Squeez
0406     do field2=1,nfi
0407         do fiel
0408             alloc
0409             Squee
0410             end do
0411     end do
0412 #endif
0413     if (DebugMsgs)
0414
0415
0416     !$OMP PARALLEL DO
0417     !$OMP PRIVATE(i11,
0418     !$OMP PRIVATE(fiel
0419
0420     do ill= 1, Sample
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 391

```
0391          if (i<=lmax_lensi
0392              CPhi(3,i) = C
0393      end if
0394      tmp = i*(i+1)/(2*
0395      CLForLensingIn(:,_
0396      ! CForLensing(i)%
0397      CForLensing(i)%C(
0398      CForLensing(i)%C(
0399      CForLensing(i)%C(
0400      CForLensing(i)%C(
0401      ! CForLensing(i)%
0402  end do
0403
0404 #ifdef FISHER
0405     allocate(SqueezedLens
0406     do field2=1,nfields
0407         do field3=1,nfiel
0408             allocate(Sque
0409             SqueezedLensi
0410             end do
0411     end do
0412 #endif
0413     if (DebugMsgs) startt
0414
0415
0416     !$OMP PARALLEL DO DEF
0417     !$OMP PRIVATE(i11,11,
0418     !$OMP PRIVATE(field1,
0419
0420     do ill= 1, SampleL%10
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 421

```
0421          l1 = SampleL%  
0422          if (l1 > lmax  
0423          tmp1=l1*(l1+1  
0424          bi_ix=0  
0425          do l2= max(lm  
0426              tmp2=l2*(l2  
0427              min_l = max  
0428              if (mod(l1+  
0429                  min_l =  
0430              end if  
0431              max_l = min  
0432              bix=bi_ix  
0433              a3j2(:,:,:,1)  
0434              if (nfields  
0435                  call GetT  
0436                  call GetT  
0437                  call GetT  
0438                  call GetT  
0439                  do l3=min  
0440                      a3j2(l3  
0441                      end do  
0442                  end if  
0443                  do field1=1  
0444                      do field  
0445                          do  
0446                              B  
0447                              b  
0448  
0449  
0450
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 421

```
0421          l1 = SampleL%  
0422          if (l1 > lmax_len  
0423          tmp1=l1*(l1+1)  
0424          bi_ix=0  
0425          do l2= max(lmin,1  
0426              tmp2=l2*(l2+1  
0427              min_l = max(a  
0428              if (mod(l1+l2  
0429                  min_l = m  
0430              end if  
0431              max_l = min(l  
0432              bix=bi_ix  
0433              a3j2(:,:,:,1)=0  
0434              if (nfields>1  
0435                  call GetT  
0436                  call GetT  
0437                  call GetT  
0438                  call GetT  
0439                  do l3=min  
0440                      a3j2(l3  
0441                      end do  
0442                  end if  
0443                  do field1=1,n  
0444                      do field2  
0445                          do fi  
0446                              B  
0447                              b  
0448  
0449  
0450
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 451

```
0451  
0452     #ifdef FISHER  
0453  
0454  
0455  
0456  
0457  
0458     #endif  
0459  
0460  
0461  
0462  
0463  
0464  
0465  
0466  
0467  
0468  
0469  
0470  
0471  
0472  
0473         end  
0474             end do  
0475                 end do  
0476  
0477             end do  
0478                 end do  
0479 !$OMP END PARALLEL  
0480 if (DebugMsgs) pr
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 451

```
0451  
0452     #ifdef FISHER  
0453  
0454  
0455  
0456  
0457  
0458     #endif  
0459  
0460  
0461  
0462  
0463  
0464  
0465  
0466  
0467  
0468  
0469  
0470  
0471  
0472  
0473         end  
0474             end do  
0475                 end do  
0476  
0477             end do  
0478                 end do  
0479 !$OMP END PARALLEL DO  
0480 if (DebugMsgs) print
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 481

```
0481  
0482         if (nfields==1) B  
0483  
0484         if (BispectrumPar  
0485  
0486             allocate(OddBis  
0487             oddix=0  
0488             do field1=1,3  
0489                 do field2=1,  
0490                     do fiel  
0491                         if (p  
0492                             oddix  
0493                             !Only  
0494                             alloc  
0495                             OddBi  
0496                         end do  
0497                     end do  
0498                 end do  
0499  
0500             !$OMP PARALLEL DO  
0501             !$OMP PRIVATE(ill,  
0502             !$OMP PRIVATE(fiel  
0503  
0504             do ill= 1, Sample  
0505                 ll = SampleL%  
0506                 if (ll > lmax  
0507                     tmp1=ll*(ll+1  
0508                     bi_ix=0  
0509                     do l2= max(lm  
0510                         tmp2=l2*(l2
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 481

```
0481  
0482         if (nfields==1) Bispe  
0483  
0484         if (BispectrumParams%  
0485  
0486             allocate(OddBispe  
0487             oddix=0  
0488             do field1=1,3  
0489                 do field2=1,3  
0490                     do field3  
0491                         if (p  
0492                             oddix  
0493                             !Only  
0494                             alloc  
0495                             OddBi  
0496                         end do  
0497                     end do  
0498                 end do  
0499  
0500             !$OMP PARALLEL DO  
0501             !$OMP PRIVATE(ill  
0502             !$OMP PRIVATE(fie  
0503  
0504             do ill= 1, Sample  
0505                 ll = SampleL%  
0506                 if (ll > lmax  
0507                     tmp1=ll*(ll+1  
0508                     bi_ix=0  
0509                     do l2= max(lm  
0510                         tmp2=l2*(l2
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 511

```
0511          min_l = max
0512          if (mod(l1+
0513              min_l =
0514          end if
0515          max_l = min
0516          bix=bi_ix
0517
0518          a3j2(:,:,:,
0519          call GetT
0520          call GetT
0521          call GetT
0522          do l3=min
0523              a3j2(l3,
0524          end do
0525
0526
0527          oddix=0
0528          do field1=1
0529              do field
0530                  do f
0531                      !
0532                      i
0533                      o
0534                      B
0535                      b
0536
0537
0538
0539
0540
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 511

```
0511          min_l = m
0512          if (mod(l
0513              min_l =
0514          end if
0515          max_l = m
0516          bix=bi_ix
0517
0518          a3j2(:,:,:,
0519          call GetT
0520          call GetT
0521          call GetT
0522          do l3=min
0523              a3j2(l3,
0524          end do
0525
0526
0527          oddix=0
0528          do field1=1
0529              do fi
0530                  do f
0531                      !
0532                      i
0533                      o
0534                      B
0535                      b
0536
0537
0538
0539
0540
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 541

```
0541  
0542  
0543  
0544  
0545  
0546  
0547  
0548  
0549  
0550  
0551  
0552  
0553  
0554  
0555  
0556  
0557  
0558  
0559  
0560      end  
0561      end do  
0562      end do  
0563  
0564      end do  
0565      end do  
0566 !$OMP END PARALLE  
0567      end if  
0568  
0569      end if  
0570
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 541

```
0541  
0542  
0543  
0544  
0545  
0546  
0547  
0548  
0549  
0550  
0551  
0552  
0553  
0554  
0555  
0556  
0557  
0558  
0559  
0560      end  
0561      end d  
0562      end do  
0563  
0564      end do  
0565      end do  
0566 !$OMP END PARALLE  
0567      end if  
0568  
0569      end if  
0570
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 571

```
0571      if (BispectrumParam  
0572  
0573          print *, 'getting re  
0574          allocate(TransferPo  
0575          do i=2,lmax  
0576              TransferPolFac(i)  
0577          end do  
0578  
0579          if (shape /= shape_  
0580          if (shape == shape_  
0581              n=1  
0582              np=1  
0583              npd=0 !derivatives  
0584          else if (shape == s  
0585              n=2  
0586              np=3  
0587              npd=0  
0588          else if (shape == s  
0589              n=1  
0590              np=2  
0591              npd=2  
0592          else  
0593              stop 'unknown shap  
0594          end if  
0595          allocate(ind(n))  
0596          allocate(indP(np))  
0597  
0598  
0599  
0600
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 571

```
0571      if (BispectrumParams%do_p  
0572  
0573          print *, 'getting redu  
0574          allocate(TransferPolF  
0575          do i=2,lmax  
0576              TransferPolFac(i)  
0577          end do  
0578  
0579          if (shape /= shape_lo  
0580          if (shape == shape_lo  
0581              n=1  
0582              np=1  
0583              npd=0 !derivative  
0584          else if (shape == sha  
0585              n=2  
0586              np=3  
0587              npd=0  
0588          else if (shape == sha  
0589              n=1  
0590              np=2  
0591              npd=2  
0592          else  
0593              call MPIStop('unk  
0594          end if  
0595          allocate(ind(n))  
0596          allocate(indP(np))  
0597  
0598  
0599  
0600
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 601

```
0601      if (npd>0) then  
0602          call InitBessel  
0603          allocate(indPd(  
0604      end if  
0605  
0606      if (shape==shape_wa  
0607          !Separable form is  
0608          ind(1) = 0  
0609          ind(2) = 2  
0610          indP(1) = 0  
0611          indP(2) = 2  
0612          indP(3) = -2  
0613      else if (shape==sha  
0614          ind(1) = 0  
0615          indP(1) = 0  
0616          indP(2) = -2  
0617          indPd(1) = 0  
0618          indPd(2) = -2  
0619      else  
0620          ind(1) = 0  
0621          indP(1) = 0  
0622      end if  
0623  
0624      test=0  
0625      call Ranges_Nullify  
0626      call Ranges_Assign(  
0627      call Ranges_Add_del  
0628      call Ranges_getArra  
0629  
0630      !$      if (BispectrumParam
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 601

```
0601      if (npd>0) then  
0602          call InitBesselDe  
0603          allocate(indPd(np  
0604      end if  
0605  
0606      if (shape==shape_warm  
0607          !Separable form i  
0608          ind(1) = 0  
0609          ind(2) = 2  
0610          indP(1) = 0  
0611          indP(2) = 2  
0612          indP(3) = -2  
0613      else if (shape==shape  
0614          ind(1) = 0  
0615          indP(1) = 0  
0616          indP(2) = -2  
0617          indPd(1) = 0  
0618          indPd(2) = -2  
0619      else  
0620          ind(1) = 0  
0621          indP(1) = 0  
0622      end if  
0623  
0624      test=0  
0625      call Ranges_Nullify(T  
0626      call Ranges_Assign(Ti  
0627      call Ranges_Add_delta  
0628      call Ranges_getArray(  
0629  
0630      !$      if (Bispect
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 631

```
0631      if (BispectrumParam  
0632          !Note that all  
0633          !And these are  
0634          call CreateTxt  
0635          call CreateTxt  
0636          call CreateTxt  
0637      end if  
0638  
0639      if (DebugMsgs) star  
0640          !$OMP PARALLEL DO DE  
0641          !$OMP PRIVATE(i,r,re  
0642          !$OMP PRIVATE(ill,l1  
0643          !$OMP PRIVATE(bi_ix,  
0644  
0645          do i= TimeStepsNong  
0646          r=(CP%tau0-TimeStep  
0647          allocate(res(CTrans  
0648          allocate(resP(CTran  
0649          allocate(res_l(1:CT  
0650          allocate(resP_l(1:C  
0651          if (npd>0) then  
0652              allocate(resPd(  
0653              allocate(resPd_  
0654          end if  
0655              call NonGauss_l_r  
0656              if (npd>0) call N  
0657          end if  
0658          if (npd>0) call N
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 631

```
0631      if (BispectrumParams%  
0632          !Note that all th  
0633          !And these are fo  
0634          call CreateTxtFil  
0635          call CreateTxtFil  
0636          call CreateTxtFil  
0637      end if  
0638  
0639      if (DebugMsgs) startt  
0640          !$OMP PARALLEL DO DEF  
0641          !$OMP PRIVATE(i,r,res  
0642          !$OMP PRIVATE(ill,l1,  
0643          !$OMP PRIVATE(bi_ix,b  
0644  
0645          do i= TimeStepsNongau  
0646          r=(CP%tau0-TimeSt  
0647          allocate(res(CTra  
0648          allocate(resP(CTr  
0649          allocate(res_l(1:  
0650          allocate(resP_l(1:  
0651          if (npd>0) then  
0652              allocate(resP(  
0653              allocate(resP_  
0654          end if  
0655              call NonGauss_l_r  
0656              if (npd>0) call N  
0657          end if  
0658          if (npd>0) call N
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 661

```
0661
0662      do field=1,nfield
0663        do j=1,n
0664          call Interpolat
0665        end do
0666        do j=1,np
0667          call Interpolat
0668        end do
0669      end do
0670      deallocate(res,re
0671
0672      if (BispectrumPar
0673        write(100,concat
0674        write(101,concat
0675        write(102,'(1E15
0676      end if
0677
0678      if (npd>0) then
0679        do j=1,npd
0680          call Interpolat
0681        end do
0682        deallocate(resPd
0683      end if
0684
0685      term = r**2 * Tim
0686
0687
0688 !Restrict to l1<=l2<=l3
0689      do ill= 1, SampleL
0690        l1 = SampleL%l(il
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 661

```
0661
0662      do field=1,nfield
0663        do j=1,n
0664          call Interpolat
0665        end do
0666        do j=1,np
0667          call Interpolat
0668        end do
0669      end do
0670      deallocate(res,re
0671
0672      if (BispectrumPar
0673        write(100,con
0674        write(101,con
0675        write(102,'(1
0676      end if
0677
0678      if (npd>0) then
0679        do j=1,npd
0680          call Interpolat
0681        end do
0682        deallocate(re
0683      end if
0684
0685      term = r**2 * Tim
0686
0687
0688 !Restrict to l1<=
0689      do ill= 1, SampleL
0690        l1 = SampleL%
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 691

```
0691      bi_ix=0
0692      do l12= max(lmin,l
0693          min_l = max(abs
0694          if (mod(l1+l2+m
0695              min_l = min_
0696      end if
0697      max_l = min(lma
0698      do field1=1,nfi
0699          do field2=1,
0700              tmp1 = 2
0701
0702                  tmp2 = 2
0703          do field3=1
0704              Bispectr
0705              bix=bi_i
0706              do l13=mi
0707                  bix=bi
0708                  Bispec
0709                  (t
0710                  end do
0711                  end do
0712                  end do
0713                  end do
0714                  bi_ix=bix
0715
0716                  end do !l2
0717                  end do !ill
0718
0719      deallocate(res_1,
0720          if (npd>0) deallo
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 691

```
0691      bi_ix=0
0692      do l12= max(lm
0693          min_l = m
0694          if (mod(l
0695              min_l
0696      end if
0697      max_l = m
0698      do field1=
0699          do fi
0700
0701
0702
0703
0704
0705
0706
0707
0708
0709
0710
0711
0712
0713
0714
0715
0716
0717
0718
0719
0720
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 721

```
0721      end do !TimeStepsNo
0722 !$OMP END PARALLEL DO
0723      if (BispectrumParam
0724          close(100)
0725          close(101)
0726          close(102)
0727      end if
0728      deallocate(Transfer
0729      call Ranges_Free(Ti
0730
0731      if (DebugMsgs) prin
0732
0733      end if !DoPrimordia
0734
0735      if (BispectrumParam
0736      !write out slice in
0737      Bscale=(COBE_CMBTe
0738      do bispectrum_type
0739          if (BispectrumPar
0740              do idelta=1,Bisp
0741                  if (mod(Bispectr
0742                      .and. b
0743                  call CreateTxtFi
0744                      B
0745                      n
0746          end do
0747      end if
0748      if (BispectrumPar
0749          call CreateTxtFi
0750              '_', Bispec
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 721

```
0721      end do !TimeStepsNong
0722 !$OMP END PARALLEL DO
0723      if (BispectrumParams%
0724          close(100)
0725          close(101)
0726          close(102)
0727      end if
0728      deallocate(TransferPo
0729      call Ranges_Free(Time
0730
0731      if (DebugMsgs) print
0732
0733      end if !DoPrimordial
0734
0735      if (BispectrumParams%Slice
0736          !write out slice in (
0737          Bscale=(COBE_CMBTemp*
0738          do bispectrum_type=1,
0739              if (BispectrumPar
0740                  do idelta=1,Bisp
0741                      if (mod(Bispectr
0742                          .and. b
0743                      call Crea
0744                          Bispe
0745                          nbisp
0746          end do
0747      end if
0748      if (BispectrumPar
0749          call CreateTx
0750              '_', Bisp
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 751

```
0751      end if  
0752      end do  
0753      do ill= 1, SampleL  
0754          l1 = SampleL%l(il  
0755          bi_ix=0  
0756          do l2= max(lmin,l  
0757              min_l = max(abs  
0758              if (mod(l1+l2+m  
0759                  min_l = min_  
0760                  end if  
0761                  max_l = min(lma  
0762                  do l3=min_l, ma  
0763                      bi_ix=bi_ix  
0764                      if (l1==Bis  
0765                          .and. any(  
0766                          !Particular  
0767                          idelta=Ind  
0768                          do bispect  
0769                              fileid=nb  
0770                              write (fi  
0771                              do field1  
0772                                  do field  
0773                                      do fie  
0774                                          wr  
0775  
0776                                  end do  
0777                                  end do  
0778      end do  
0779      write (fi  
0780      end do
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 751

```
0751      end if  
0752      end do  
0753      do ill= 1, SampleL%10  
0754          l1 = SampleL%l(il  
0755          bi_ix=0  
0756          do l2= max(lmin,l  
0757              min_l = max(a  
0758              if (mod(l1+l2  
0759                  min_l = m  
0760                  end if  
0761                  max_l = min(l  
0762                  do l3=min_l,  
0763                      bi_ix=bi_ix  
0764                      if (l1==B  
0765                          .and.  
0766                          !Part  
0767                          idelt  
0768                          do bi  
0769                              f  
0770                              w  
0771  
0772  
0773  
0774  
0775  
0776  
0777  
0778  
0779  
0780      e  
      w  
      end d
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 781

```
0781      end if !sli
0782      if (Bispect
0783          if (Bispe
0784              ll
0785
0786          do bispe
0787              if (bi
0788                  write(
0789                      do fie
0790                          do fi
0791                              do f
0792                                  writ
0793
0794          end d
0795          end do
0796      end do
0797      write (
0798          end do
0799      end if
0800
0801          end do
0802      end do
0803  end do
0804  if (BispectrumParam
0805      do ill= 1, Samp
0806          ll = SampleL%
0807          bi_ix=0
0808          do l2= max(lm
0809              min_l = max
0810              if (mod(11+
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 781

```
0781      end if !s
0782      if (Bispe
0783          if (B
0784              ll
0785
0786      do bi
0787          i
0788          w
0789          d
0790
0791      do f
0792          wr
0793
0794      end d
0795      end do
0796  end do
0797  write (
0798      end do
0799
0800
0801      end do
0802  end do
0803  end do
0804  if (BispectrumParams%
0805      do ill= 1, Sample
0806          ll = SampleL%
0807          bi_ix=0
0808          do l2= max(lm
0809              min_l = max
0810              if (mod(1
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 811

```
0811      min_l =  
0812      end if  
0813      max_l = min  
0814      do l3=min_l  
0815          bi_ix=b  
0816          if (l1=  
0817              .and.  
0818              !Partic  
0819                  idelta  
0820                  do bis  
0821                      if (b  
0822                          filei  
0823                          write  
0824                          oddix  
0825                          do fi  
0826                              do f  
0827                                  do  
0828  
0829  
0830  
0831          en  
0832          end  
0833          end  
0834          write  
0835          end do  
0836          end if  
0837          end do  
0838          end do  
0839          end do  
0840      end do
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 811

```
0811      min_l =  
0812      end if  
0813      max_l = m  
0814      do l3=min_l  
0815          bi_ix=b  
0816          if (l1=  
0817              .and.  
0818              !  
0819                  i  
0820  
0821  
0822  
0823  
0824  
0825  
0826  
0827  
0828  
0829  
0830  
0831          en  
0832          end  
0833          end  
0834          write  
0835          end do  
0836          end if  
0837          end do  
0838          end do  
0839          end do  
0840      end do
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 841

```
0841      end if  
0842  
0843      do bispectrum_type=  
0844          if (BispectrumPar  
0845              do idelta=1,Bisp  
0846                  if (mod(Bispect  
0847                      .and. b  
0848                          close(nbispectr  
0849                      end do  
0850                  end if  
0851                  if (BispectrumPar  
0852                      end do  
0853  
0854          end if  
0855  
0856 #ifdef FISHER  
0857             if (BispectrumParam  
0858                 !Get stuff for Fisher etc.  
0859  
0860                 print *, 'Getting Fi  
0861  
0862                 Noise = BispectrumP  
0863                 NoiseP = Bispectrum  
0864  
0865                 do i=lmin,lmax  
0866                     if (CP%DoLensing  
0867                         cl(:,i) = CL_le  
0868                     else  
0869                         cl(1,i) = CL_Sc  
0870                         cl(2,i) = CL_Sc
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 841

```
0841      end if  
0842  
0843      do bispectrum_type=1,  
0844          if (BispectrumPar  
0845              do idelta=1,B  
0846                  if (mod(B  
0847                      .and.  
0848                          close(nbi  
0849                      end do  
0850                  end if  
0851                  if (BispectrumPar  
0852                      end do  
0853  
0854          end if  
0855  
0856 #ifdef FISHER  
0857             if (BispectrumParams%DoFi  
0858                 !Get stuff for Fisher  
0859  
0860                 print *, 'Getting Fish  
0861  
0862                 Noise = BispectrumPar  
0863                 NoiseP = BispectrumPa  
0864  
0865                 do i=lmin,lmax  
0866                     if (CP%DoLensing)  
0867                         cl(:,i) = CL_le  
0868                     else  
0869                         cl(1,i) = CL_Sc  
0870                         cl(2,i) = CL_Sc
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 871

```
0871      cl(4,i) = CL_Sc  
0872      cl(3,i) = 0  
0873      end if  
0874      if (CP%WantTensor)  
0875          cl(:,i) = cl(:,  
0876          end if  
0877      end do  
0878      if (.false.) then  
0879          call OpenTxtFile  
0880          do i=lmin,lmax  
0881              !Assume T,E,B,  
0882              read(3,*) j, c  
0883              if (j<lmin) re  
0884                  cl(:,i)=cl(:,i  
0885              end do  
0886              close(3)  
0887      end if  
0888  
0889      if (Noise >0) then  
0890          file_tag = concat(  
0891      end if  
0892      xlc= 180*sqrt(8.*lo  
0893      sigma2 = (Bispectrum  
0894      allocate(InvC(lmax))  
0895      do l1= lmin, lmax  
0896          tmp = l1*(l1+1)/  
0897          Cl(1,l1) = Cl(1,  
0898          Cl(2:3,l1) = Cl(2:  
0899          Cl(4,l1) = Cl(4,  
0900          allocate(InvC(l1
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 871

```
0871      cl(4,i) = CL_Sc  
0872      cl(3,i) = 0  
0873      end if  
0874      if (CP%WantTensor)  
0875          cl(:,i) = cl(:,  
0876          end if  
0877      end do  
0878      if (.false.) then  
0879          call OpenTxtFile(  
0880          do i=lmin,lmax  
0881              !Assume T,E,B  
0882              read(3,*) j,  
0883              if (j<lmin) r  
0884                  cl(:,i)=cl(:,  
0885              end do  
0886              close(3)  
0887      end if  
0888  
0889      if (Noise >0) then  
0890          file_tag = concat(  
0891      end if  
0892      xlc= 180*sqrt(8.*log(  
0893      sigma2 = (BispectrumP  
0894      allocate(InvC(lmax))  
0895      do l1= lmin, lmax  
0896          tmp = l1*(l1+1)/(  
0897          Cl(1,l1) = Cl(1,1  
0898          Cl(2:3,l1) = Cl(2:  
0899          Cl(4,l1) = Cl(4,1  
0900          allocate(InvC(l1
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 901

```
0901         if (nfields > 2)  
0902             if (nfields==1)  
0903                 InvC(11)%C(1,1)  
0904             else  
0905                 InvC(11)%C(1,1)  
0906                 InvC(11)%C(1,2)  
0907                 InvC(11)%C(2,1)  
0908                 InvC(11)%C(2,2)  
0909                 InvC(11)%C= Inv  
0910             end if  
0911         end do  
  
0913     if (debugMsgs) startt  
0914         allocate(ifish_contri  
0915         !This loop is just in  
0916         do lmaxcuti=SampleL%1  
0917             !         call CreateTxtFile(  
0918             !         do lmaxcuti=1, Sampl  
0919             !         if (SampleL%1(lmaxcu  
0920             !  
0921             lmax= SampleL%1(lma  
0922             !  
0923             ifish_contribs=0  
0924             lstart = 2 !lmin  
0925             !$OMP PARALLEL DO DE  
0926             !$OMP PRIVATE(i11,l11  
0927             !$OMP PRIVATE(Bispec  
0928             !$OMP PRIVATE(field1  
0929             do ill= 1, lmaxcut  
0930
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 901

```
0901         if (nfields > 2)  
0902             if (nfields==1) t  
0903                 InvC(11)%C(1,  
0904             else  
0905                 InvC(11)%C(1,  
0906                 InvC(11)%C(1,  
0907                 InvC(11)%C(2,  
0908                 InvC(11)%C(2,  
0909                 InvC(11)%C= I  
0910             end if  
0911         end do  
  
0913     if (debugMsgs) startt  
0914         allocate(ifish_contri  
0915         !This loop is just in  
0916         do lmaxcuti=SampleL%1  
0917             !         call CreateT  
0918             !         do lmaxcuti=1  
0919             !         if (SampleL%1  
0920             !  
0921             lmax= SampleL%1(lma  
0922             !  
0923             ifish_contribs=0  
0924             lstart = 2 !lmin  
0925             !$OMP PARALLEL DO DE  
0926             !$OMP PRIVATE(i11,l11  
0927             !$OMP PRIVATE(Bispec  
0928             !$OMP PRIVATE(field1  
0929             do ill= 1, lmaxc  
0930
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 931

```
0931      allocate(fish_l1( 0931      allocate(fish
0932      l1 = SampleL%l(il 0932      l1 = SampleL%
0933      if (l1< lstart) c 0933      if (l1< lstar
0934      fish_l1=0          0934      fish_l1=0
0935      bi_ix=0           0935      bi_ix=0
0936      do l2 = l1,lmax   0936      do l2 = l1,lm
0937      if (l2< lstart)   0937      if (l2< l
0938      min_l = max(lst  0938      min_l = m
0939      if (mod(l1+l2+m  0939      if (mod(l
0940      min_l = min_     0940      min_l =
0941      end if            0941      end if
0942      max_l = min(lma  0942      max_l = m
0943      call GetThreeJs 0943      call GetT
0944      do l3=min_l,max 0944      do l3=min
0945      a3j_00(l3)=a3    0945      a3j_0
0946      end do            0946      end do
0947      [REDACTED]         0947
0948      tmp1= 1.d0/(4*p  0948      tmp1= 1.d
0949      minl2=min_l       0949      minl2=min
0950      bix=bi_ix         0950      bix=bi_ix
0951      do field1=1,nf    0951      do field1
0952      do f1=1,nfiel    0952      do f1
0953      tmpf(1)= Inv    0953      t
0954      do field2=1,     0954      d
0955      do f2=1,nf       0955
0956      tmpf(2)=          0956
0957      do field        0957
0958      do bisp          0958
0959      if (bis          0959
0960      Bispe           0960
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 931

```
0931      allocate(fish 0931      allocate(fish
0932      l1 = SampleL% 0932      l1 = SampleL%
0933      if (l1< lstar  0933      if (l1< lstar
0934      fish_l1=0       0934      fish_l1=0
0935      bi_ix=0         0935      bi_ix=0
0936      do l2 = l1,lm   0936      do l2 = l1,lm
0937      if (l2< l)      0937      if (l2< l
0938      min_l = m       0938      min_l = m
0939      if (mod(l1+l2+m 0939      if (mod(l
0940      min_l = min_    0940      min_l =
0941      end if           0941      end if
0942      max_l = m        0942      max_l = m
0943      call GetT        0943      call GetT
0944      do l3=min_l,max 0944      do l3=min
0945      a3j_0            0945      a3j_0
0946      end do            0946      end do
0947      [REDACTED]         0947
0948      tmp1= 1.d          0948      tmp1= 1.d
0949      minl2=min_l       0949      minl2=min
0950      bix=bi_ix         0950      bix=bi_ix
0951      do field1=1,      0951      do field1
0952      do f1=1,          0952      do f1
0953      tmpf(1)= Inv    0953      t
0954      do field2=1,     0954      d
0955      do f2=1,          0955
0956      tmpf(2)=          0956
0957      do field        0957
0958      do bisp          0958
0959      if (bis          0959
0960      Bispe           0960
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 961

```
0961          else  
0962          Bispe  
0963      end if  
0964      do f3=1  
0965  
0966      do bi  
0967      if (b  
0968          Bis  
0969      else  
0970          Bis  
0971      end i  
0972  
0973  
0974      min_l  
0975      bi_ix  
0976      if (m  
0977          !  
0978  
0979  
0980  
0981  
0982  
0983  
0984  
0985  
0986  
0987  
0988  
0989  
0990      else
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 961

```
0961  
0962  
0963  
0964  
0965  
0966  
0967  
0968  
0969  
0970  
0971  
0972  
0973  
0974  
0975  
0976  
0977  
0978  
0979  
0980  
0981  
0982  
0983  
0984  
0985  
0986  
0987  
0988  
0989  
0990
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 991

```
0991  
0992  
0993  
0994  
0995  
0996  
0997  
0998  
0999  
1000  
1001  
1002  
1003  
1004  
1005  
1006  
1007  
1008  
1009  
1010  
1011  
1012  
1013  
1014  
1015  
1016  
1017  
1018  
1019  
1020
```

tmp=  
end i  
tmp2=  
do 13  
b  
t  
end d  
if (1  
tm  
els  
tm  
end i  
fish\_  
fish  
end d  
end do  
end do  
end do !  
end do !f  
end do !fie  
end do !f1  
end do !field  
end do !12  
ifish\_contribs(il  
deallocate(fish\_L

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 991

0991  
0992  
0993  
0994  
0995  
0996  
0997  
0998  
0999  
1000  
1001  
1002  
1003  
1004  
1005  
1006  
1007  
1008  
1009  
1010  
1011  
1012  
1013  
1014  
1015  
1016  
1017  
1018  
1019  
1020">e  
end d  
end do !  
end do !12  
ifish\_contrib  
deallocate(fi

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1021

```
1021  
1022         end do  
1023 !$OMP END PARALLEL D  
1024     if (DebugMsgs) prin  
1025  
1026  
1027         allocate(fish_contr  
1028         allocate(Fisher(nbi  
1029         allocate(tmpFisher(  
1030         allocate(Fisher_L1(  
1031  
1032         do bispectrum_type=  
1033             do bispectrum_type  
1034  
1035                 fish_contribs=0  
1036                 do field1=1,nfield  
1037                     do f1=1,nfields  
1038                         call InterpolateC  
1039                             fish_  
1040                         end do  
1041             end do  
1042             Fisher(bispectrum_  
1043                 do i=lmin, CTrans%  
1044                     do field1=1,nfiel  
1045                         do f1=1,nfields  
1046                             Fisher_L1(i,(bi  
1047                             Fisher_L1(i,(bi  
1048                             tmp=fish_contr  
1049                             if (bispectrum_  
1050                                 tmp = tmp * CP
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1021

```
1021  
1022         end do  
1023 !$OMP END PARALLEL D  
1024     if (DebugMsgs) prin  
1025  
1026  
1027         allocate(fish_contr  
1028         allocate(Fisher(nbi  
1029         allocate(tmpFisher(  
1030         allocate(Fisher_L1(  
1031  
1032         do bispectrum_type=  
1033             do bispectrum_type  
1034  
1035                 fish_contribs=0  
1036                 do field1=1,nfield  
1037                     do f1=1,nfields  
1038                         call InterpolateC  
1039                             fish_  
1040                         end do  
1041             end do  
1042             Fisher(bispectrum_  
1043                 do i=lmin, CTrans%  
1044                     do field1=1,nfiel  
1045                         do f1=1,nfields  
1046                             Fisher_L1(i,(bi  
1047                             Fisher_L1(i,(bi  
1048                             tmp=fish_contr  
1049                             if (bispectrum_  
1050                                 tmp = tmp * CP
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1051

```
1051      end if  
1052      if (bispectrum_  
1053          tmp = tmp * CP  
1054      end if  
1055      Fisher(bispectr  
1056      end do  
1057      end do  
1058      end do  
1059      Fisher(bispectrum_  
1060  
1061      print *, 'Zero-sign  
1062          ':' , Fi  
1063  
1064 !!!! contribution of lensing  
1065 !           if (bispectrum_ty  
1066 !               fish_contribs_  
1067 !                   tmpArr=0  
1068 !                   call Interpolat  
1069 !                       do i=lmin, lm  
1070 !                           if (CPhi(1+1,  
1071 !                               fish_contrib  
1072 !                                   tmpArr(i)*  
1073 !                           end if  
1074 !                   end do  
1075 !                   print *, 'signa  
1076 !               end if  
1077 ! !!! same with polarization  
1078 !           if (bispectrum_type == fnl  
1079 !               fish_contribs_si  
1080 !                   do i=lmin, lmax_
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1051

```
1051  
1052  
1053  
1054  
1055  
1056  
1057  
1058  
1059  
1060  
1061  
1062  
1063  
1064 !!!! cont  
1065 !  
1066 !  
1067 !  
1068 !  
1069 !  
1070 !  
1071 !  
1072 !  
1073 !  
1074 !  
1075 !  
1076 !  
1077 !!!! same  
1078 !           if (bi  
1079 !  
1080 !
```

/Users/lp1lopa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1081

```
1081 !          corrsize = count
1082 !          allocate(fish_L)
1083 !          allocate(fish_L)
1084 !          fish_L_ij=0
1085 !          ix1=0
1086 !          do field1=1,nfi
1087 !              ix1=ix1+1
1088 !              ix2=0
1089 !              do f1=1,nfield
1090 !                  ix2=ix2+1
1091 !                  fish_L_nois
1092 !                  fish_L_ij(i
1093 !                      CPhi(1,
1094 !                      end do
1095 !                      end do
1096 !                      fish_L_ij=matmu
1097 !                      fish_contribs_s
1098 !                      deallocate(fish
1099 !                      deallocate(fish
1100 !                      end do
1101 !                      print *, 'fnl sig
1102 !      end if
1103 !      if (bispectrum_typ
1104
1105 !          print *, 'doing si
1106 !          fish_contribs_sig
1107 !          do i=lmin, lmax_l
1108 !              corrsize = count
1109 !              allocate(fish_L_
1110 !
```

/Users/lp1lopa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1081

```
1081 !
1082 !
1083 !
1084 !
1085 !
1086 !
1087 !
1088 !
1089 !
1090 !
1091 !
1092 !
1093 !
1094 !
1095 !
1096 !
1097 !
1098 !
1099 !
1100 !
1101 !
1102 !
1103 !
1104 !
1105 !
1106 !
1107 !
1108 !
1109 !
1110 !
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1111

```
1111      allocate(fish_L_
1112      fish_L_ij=0
1113      ix1=0
1114      do field1=1,nfie
1115          if (CPhi(1+fiel
1116              ix1=ix1+1
1117              ix2=0
1118              do f1=1,nfields
1119                  if (CPhi(1+f1,
1120                      ix2=ix2+1
1121                      fish_L_noise
1122                      fish_L_ij(ix
1123                          CPhi(1,i
1124
1125                  end if
1126                  end do
1127                  end if
1128              end do
1129              call Matrix_Inv
1130              fish_L_ij=fish_
1131              call Matrix_Inv
1132              fish_contribs_s
1133              deallocate(fish_
1134              deallocate(fish_
1135          end do
1136          print *, 'Lensing
1137
1138      end if
1139
1140  end do
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1111

```
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
```

a  
f  
i  
d  
  
e  
c  
f  
c  
f  
d  
d  
end d  
print  
end if  
end do

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1141

```
1141      end do  
1142      deallocate(fish_cont  
1143  
1144      print *, 'Results a  
1145      do bispectrum_type=  
1146          print *, trim(IntTo  
1147              ': 1/sq  
1148      end do  
1149  
1150      do bispectrum_type=  
1151          do bispectrum_type  
1152              bias = Fisher(bis  
1153              print *, 'Bias of  
1154                  trim(BispectrumN  
1155          end do  
1156          if (bispectrum_ty  
1157              !  
1158      end do  
1159  
1160      tmpFisher=Fisher  
1161      do bispectrum_type=  
1162          tmp = sqrt(tmpFis  
1163          tmpFisher(bispect  
1164          tmpFisher(:,bispe  
1165      end do  
1166      if (nbispectra>1) t  
1167          print *, 'Zero-sign  
1168          do bispectrum_type  
1169              print *, tmpFisher  
1170          end do
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1141

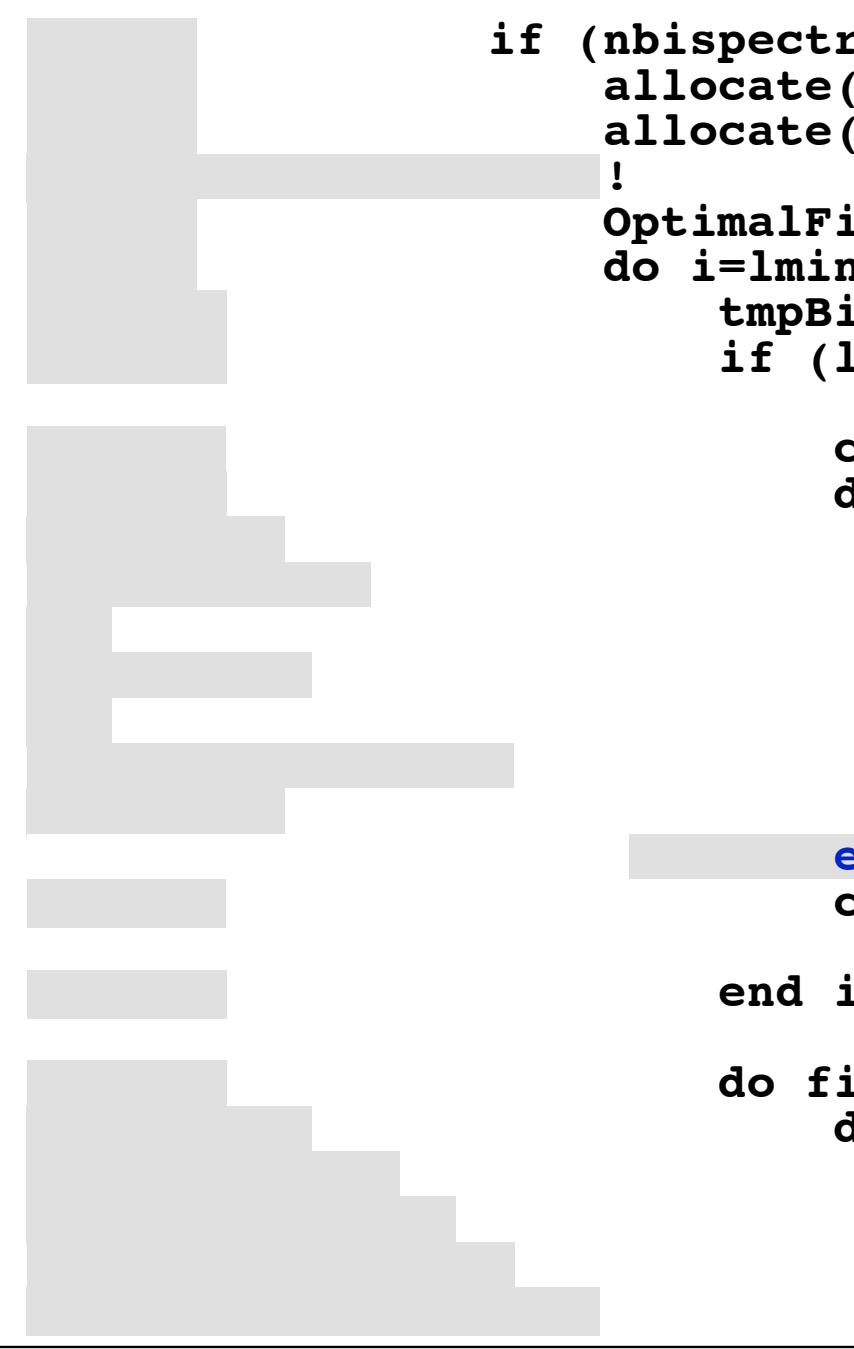
```
1141      end do  
1142      deallocate(fish_c  
1143  
1144      print *, 'Results  
1145      do bispectrum_typ  
1146          print *, trim(  
1147              ': 1/sqrt  
1148      end do  
1149  
1150      do bispectrum_typ  
1151          do bispectrum  
1152              bias = Fi  
1153              print *, '  
1154                  trim(  
1155          end do  
1156          !  
1157          !  
1158      end do  
1159  
1160      tmpFisher=Fisher  
1161      do bispectrum_type=  
1162          tmp = sqrt(tm  
1163          tmpFisher(bis  
1164          tmpFisher(:,b  
1165      end do  
1166      if (nbispectra>1)  
1167          print *, 'Zero  
1168          do bispectrum  
1169              print *, t  
1170          end do
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1171

```
1171  
1172         if (nbispectra > 1)  
1173             allocate(Optima  
1174                 allocate(tmpBig  
1175                     allocate(diag(  
1176                         OptimalFisher=0  
1177                         do i=lmin, lmax  
1178                             tmpBigFisher  
1179                             if (lens_bis  
1180  
1181                                 call Mat  
1182                                 do field  
1183                                     do fie  
1184                                         tmpBi  
1185  
1186  
1187  
1188             (CPhi(  
1189             end do  
1190         end do  
1191         call Mat  
1192     end if  
1193  
1194     do field1=1,  
1195         do field2=1  
1196             do bispect  
1197                 do bispe  
1198                     if (bi  
1199                         tmp=C  
1200
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1171

```
1171  
1172         if (nbispectr  
1173             allocate(  
1174                 allocate(  
1175                     !  
1176                     OptimalFi  
1177                     do i=lmin  
1178                         tmpBi  
1179                         if (l  
1180  
1181  
1182  
1183  
1184  
1185  
1186  
1187  
1188  
1189  
1190  
1191  
1192  
1193  
1194  
1195  
1196  
1197  
1198  
1199  
1200
```



/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1201

```
1201          else  
1202              tmp=1  
1203          end if  
1204          if (bi  
1205              tmp=t  
1206          end if  
1207          Optima  
1208              tmp*  
1209          end do  
1210          end do  
1211          end do  
1212      end do  
1213      end do  
1214      deallocate(tmpB  
1215  end if  
1216  
1217  do bispectrum_type=  
1218      print *, 'Optimal I  
1219          ': 1/sq  
1220      end do  
1221      tmpFisher=OptimalFi  
1222      call Matrix_Inverse  
1223      do bispectrum_type=  
1224          print *, 'Optimal I  
1225          ': Cov_  
1226      end do  
1227      tmpFisher=OptimalFi  
1228      do bispectrum_type=  
1229          tmp = sqrt(tmpFis  
1230          tmpFisher(bispect
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1201

```
1201  
1202  
1203  
1204  
1205  
1206  
1207  
1208  
1209  
1210  
1211  
1212  
1213  
1214  
1215  
1216  
1217  
1218  
1219  
1220  
1221  
1222  
1223  
1224  
1225  
1226  
1227  
1228  
1229  
1230
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1231

```
1231          tmpFisher(:,bispe
1232      end do
1233      print *, 'Optimal B
1234      do bispectrum_type
1235          print *,tmpFisher
1236      end do
1237      end if
1238
1239      deallocate(Fisher,
1240
1241      end do
1242
1243      deallocate(ifish_co
1244      deallocate(InvC)
1245
1246      end if !DoFisher
1247 #else
1248      if (BispectrumParam
1249 #endif
1250
1251      !Tidy up a bit
1252      do field1=1,nfields
1253          do field2=1,nfie
1254              do field3=1
1255                  do bispec
1256                      deallocat
1257                      end do
1258                  end do
1259              end do
1260          end do
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1231

```
1231          tmpFisher
1232      end do
1233      print *, 'Opti
1234      do bispectrum
1235          print *,t
1236      end do
1237      end if
1238
1239      deallocate(Fisher
1240
1241      end do
1242
1243      deallocate(ifish_cont
1244      deallocate(InvC)
1245
1246      end if !DoFisher
1247 #else
1248      if (BispectrumParams%DoFi
1249 #endif
1250
1251      !Tidy up a bit
1252      do field1=1,nfields
1253          do field2=1,nfields
1254              do field3=1,nfiel
1255                  do bispectrum
1256                      deallocat
1257                      end do
1258                  end do
1259              end do
1260      end do
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1261

```
1261      deallocate(Bispectr
1262      if (allocated(CForL
1263
1264      if (allocated(OddBis
1265          oddix=0
1266          do field1=1,3
1267              do field2=1,
1268                  do fiel
1269                      if (p
1270                          oddix
1271                          deall
1272                      end do
1273                  end do
1274              end do
1275          deallocate(OddBisp
1276      end if
1277
1278      end subroutine GetBis
```

```
1279
1280
1281 !not needed for local NG
1282 subroutine NonGauss_d
1283 !As above, but integr
1284 Type(ClTransferData
1285 real(dl), intent(in
1286 integer, intent(in)
1287 real(dl) resp(CTran
1288 real(dl), intent(in
1289 integer q_ix, j, be
1290 integer nP, ellmax
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1261

```
1261      deallocate(Bispectra)
1262      if (allocated(CForLensing
1263
1264      if (allocated(OddBispectr
1265          oddix=0
1266          do field1=1,3
1267              do field2=1,3
1268                  do field3=1,3
1269                      if (parit
1270                          oddix=odd
1271                          deallocated
1272                      end do
1273                  end do
1274              end do
1275          deallocate(OddBispect
1276      end if
1277
1278      end subroutine GetBispect
```

```
1279
1280
1281 !not needed for local NG
1282 subroutine NonGauss_deriv
1283 !As above, but integral a
1284 Type(ClTransferData) :: C
1285 real(dl), intent(in) :: d
1286 integer, intent(in) :: in
1287 real(dl) resp(CTrans%ls%l
1288 real(dl), intent(in) :: r
1289 integer q_ix, j, bes_ix,
1290 integer nP, ellmax
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1291

```
1291      real(dl) xf , dJ_1,  
1292  
1293      nP =size(indP)  
1294      resP = 0  
1295      do q_ix = 1, CTrans  
1296  
1297          k = CTrans%q%poin  
1298          xf = k*r !kr  
1299          bes_ix=Ranges_ind  
1300          fac=BessRanges%po  
1301          a2=(BessRanges%po  
1302          fac=fac**2*a2/6  
1303          dlnk = CTrans%q%d  
1304          P = ScalarPower(k  
1305          ellmax = max(xf/(  
1306  
1307          do j=1,CTrans%ls%  
1308              if (CTrans%ls%l(  
1309                  dJ_1=a2*dj1(bes  
1310                      *dddj  
1311  
1312              term = CTrans%De  
1313              do i=1,nP  
1314                  resP(j,i) = res  
1315              end do  
1316  
1317          end if  
1318          end do  
1319      end do  
1320      resP = resP * fourpi
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1291

```
1291      real(dl) xf , dJ_1, fac,  
1292  
1293      nP =size(indP)  
1294      resP = 0  
1295      do q_ix = 1, CTrans%q%npo  
1296  
1297          k = CTrans%q%points(q  
1298          xf = k*r !kr  
1299          bes_ix=Ranges_indexOf  
1300          fac=BessRanges%points  
1301          a2=(BessRanges%points  
1302          fac=fac**2*a2/6  
1303          dlnk = CTrans%q%dpoint  
1304          P = ScalarPower(k, 1)  
1305          ellmax = max(xf/(1-xl  
1306  
1307          do j=1,CTrans%ls%10  
1308              if (CTrans%ls%l(j  
1309                  dJ_1=a2*dj1(b  
1310                      *dddj1(be  
1311  
1312          term = CTrans  
1313          do i=1,nP  
1314              resP(j,i) = res  
1315          end do  
1316  
1317      end if  
1318      end do  
1319  end do  
1320  resP = resP * fourpi
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1321

```
1321  
1322      end subroutine NonGau  
1323  
1324      subroutine Bispectrum_  
1325        Type(TBispectrumParams  
1326  
1327        B%nfields=2  
1328        B%Slice_Base_L=0  
1329        B%ndelta=0  
1330        B%DoFisher = .true.  
1331        B%FisherNoise = 0 !  
1332        B%FisherNoisePol =  
1333        B%FisherNoiseFwhmAr  
1334        B%FullOutputFile=''  
1335        B%SparseFullOutput  
1336        B%do_lensing_bispec  
1337        B%do_primordial_bis  
1338        B%do_parity_odd = .  
1339        B%export_alpha_beta  
1340  
1341      end subroutine Bispect  
1342  
1343  
1344      subroutine Bispectrum_  
1345        use IniFile  
1346        Type(TBispectrumPar  
1347        character(LEN=*), i  
1348        Type(TIniFile) :: I  
1349        integer i  
1350
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1321

```
1321  
1322      end subroutine NonGauss_d  
1323  
1324      subroutine Bispectrum_Set  
1325        Type(TBispectrumParams) :  
1326  
1327        B%nfields=2  
1328        B%Slice_Base_L=0  
1329        B%ndelta=0  
1330        B%DoFisher = .true.  
1331        B%FisherNoise = 0 !2d-4 !  
1332        B%FisherNoisePol = 4*B%Fi  
1333        B%FisherNoiseFwhmArcmin =  
1334        B%FullOutputFile='' !quit  
1335        B%SparseFullOutput = .fal  
1336        B%do_lensing_bispectrum =  
1337        B%do_primordial_bispectru  
1338        B%do_parity_odd = .false.  
1339        B%export_alpha_beta = .fa  
1340  
1341      end subroutine Bispectrum  
1342  
1343  
1344      subroutine Bispectrum_Rea  
1345        use IniFile  
1346        Type(TBispectrumParams) :  
1347        character(LEN=*), intent(  
1348        Type(TIniFile) :: Ini  
1349        integer i  
1350
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1351

```
1351      call Bispectrum_Set
1352
1353      B%do_lensing_bispec
1354      B%do_primordial_bis
1355
1356      do_bispectrum= B%do
1357
1358      if (do_bispectrum)
1359
1360      output_root = outro
1361
1362      B%nfields = Ini_Read_
1363      if (B%nfields /= 2
1364      B%do_parity_odd = Ini_
1365      if (B%do_parity_odd
1366          B%do_parity_odd
1367          write(*,*) 'Ignor
1368      end if
1369      B%Slice_Base_L = Ini_
1370      if (B%Slice_Base_L>
1371          B%ndelta = Ini_Read_
1372          if (B%ndelta > max
1373              do i=1, B%ndelta
1374                  B%deltas(i) = I
1375              end do
1376              if (.not. B%do_par
1377                  any(mod(B%Slice_
1378                      stop 'Slice is
1379
1380      end if
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1351

```
1351      call Bispectrum_SetDefPar
1352
1353      B%do_lensing_bispectrum =
1354      B%do_primordial_bispectru
1355
1356      do_bispectrum= B%do_lensi
1357
1358      if (do_bispectrum) then
1359
1360      output_root = outroot
1361
1362      B%nfields = Ini_Read_
1363      if (B%nfields /= 2 .a
1364      B%do_parity_odd = Ini_
1365      if (B%do_parity_odd .
1366          B%do_parity_odd =
1367          write(*,*) 'Ignor
1368      end if
1369      B%Slice_Base_L = Ini_
1370      if (B%Slice_Base_L>0)
1371          B%ndelta = Ini_Re
1372          if (B%ndelta > ma
1373              do i=1, B%ndelta
1374                  B%deltas(i) =
1375              end do
1376              if (.not. B%do_pa
1377                  any(mod(B%Slice_
1378                      call MPIStop(
1379
1380      end if
```

/Users/lp1opa/Compare/camb\_simdata/SeparableBispectrum.F90, Top line: 1381

```
1381      B%DoFisher = Ini_Re  
1382      if (B%DoFisher) the  
1383          B%FisherNoise = In  
1384          B%FisherNoisePol =  
1385              B%FisherNoiseFwhmA  
1386      end if  
1387      B%FullOutputFile =  
1388      if (B%FullOutputFil  
1389          B%SparseFullOutput  
1390      end if  
1391      if (B%do_primordial  
1392          B%export_alpha_b  
1393      end if  
1394      end if  
1395      end subroutine Bispec  
1396  end module Bispectrum  
1397  
1398  
1399  
1400
```

/Users/lp1opa/Compare/camb\_des/SeparableBispectrum.F90, Top line: 1381

```
1381      B%DoFisher = Ini_Read  
1382      if (B%DoFisher) then  
1383          B%FisherNoise = I  
1384          B%FisherNoisePol =  
1385              B%FisherNoiseFwhm  
1386      end if  
1387      B%FullOutputFile = In  
1388      if (B%FullOutputFile  
1389          B%SparseFullOutpu  
1390      end if  
1391      if (B%do_primordial_b  
1392          B%export_alpha_be  
1393      end if  
1394      end if  
1395      end subroutine Bispectrum  
1396  end module Bispectrum  
1397  
1398  
1399  
1400
```