DIVISIÓN DE CIENCIAS E INGENIERÍAS
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MONTEPYTHON

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IV Taller de Métodos Numéricos y Estadísticos en Cosmología

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¿Dónde descargar MontePython?

http://baudren.github.io/montepython.html

https://github.com/baudren/montepython_public

Paquetería Python a usar:

- `numpy`
- `scipy`
- `cython`
- `astropy`
- `pyfits`
- `pandas`

Para instalarlos escriba en la terminal:

```
pip install cython
```

(si Python fue instalado a través de Anaconda o miniconda):

```
conda install cython
```

Datos de las observaciones

- BAO
- BICEP
- Cosmic Clocks
- JLA
- Planck
- WIGGLEZ

Para JLA los datos deben ser descargados manualmente desde

http://supernovae.in2p3.fr/sdss_snls_jla/jla_likelihood_v4.tgz

Para Planck los datos deben ser descargados manualmente desde

http://pla.esac.esa.int/pla/#home

Vinculación de CLASS con MontePython

Dentro de la carpeta montepython_public encontrarán un archivo llamado `default.conf.template`

Copiar ese archivo y llamarlo `default.conf`

¿Cómo correr MontePython?

ANTES: asegurarse de haber compilado CLASS

```
make clean
make
```

Para correr MontePython se debe ejecutar el siguiente comando una vez ubicados en montepython_public:

```
montepython/MontePython.py run -p archivo_de_parámetros.param
-o archivo_de_salida -N número_de_pasos
```

Al terminar la corrida, en el archivo de salida se encontrarán los siguientes archivos

- fecha_número_de_pasos_.paramnames
- fecha_número_de_pasos__número_de_cadenas.txt
- log.param

Análisis de las cadenas

Dentro de la carpeta montepython_public ejecutar lo siguiente en la línea de comando

```
montepython/MontePython.py info archivo_de_salida --want-covmat
```

Al terminar el análisis, en el archivo de salida se encontrarán los siguientes archivos

- archivo_de_salida.bestfit
- archivo_de_salida.covmat —want-covmat
- archivo_de_salida.h_info
- archivo_de_salida.v_info
- archivo_de_salida.tex
- archivo_de_salida.log

Carpeta plots con los siguientes archivos

- archivo_de_salida_1d.pdf
- archivo_de_salida_triangle.pdf

posteriors

Ejemplo con JLA

Corriendo MontePython

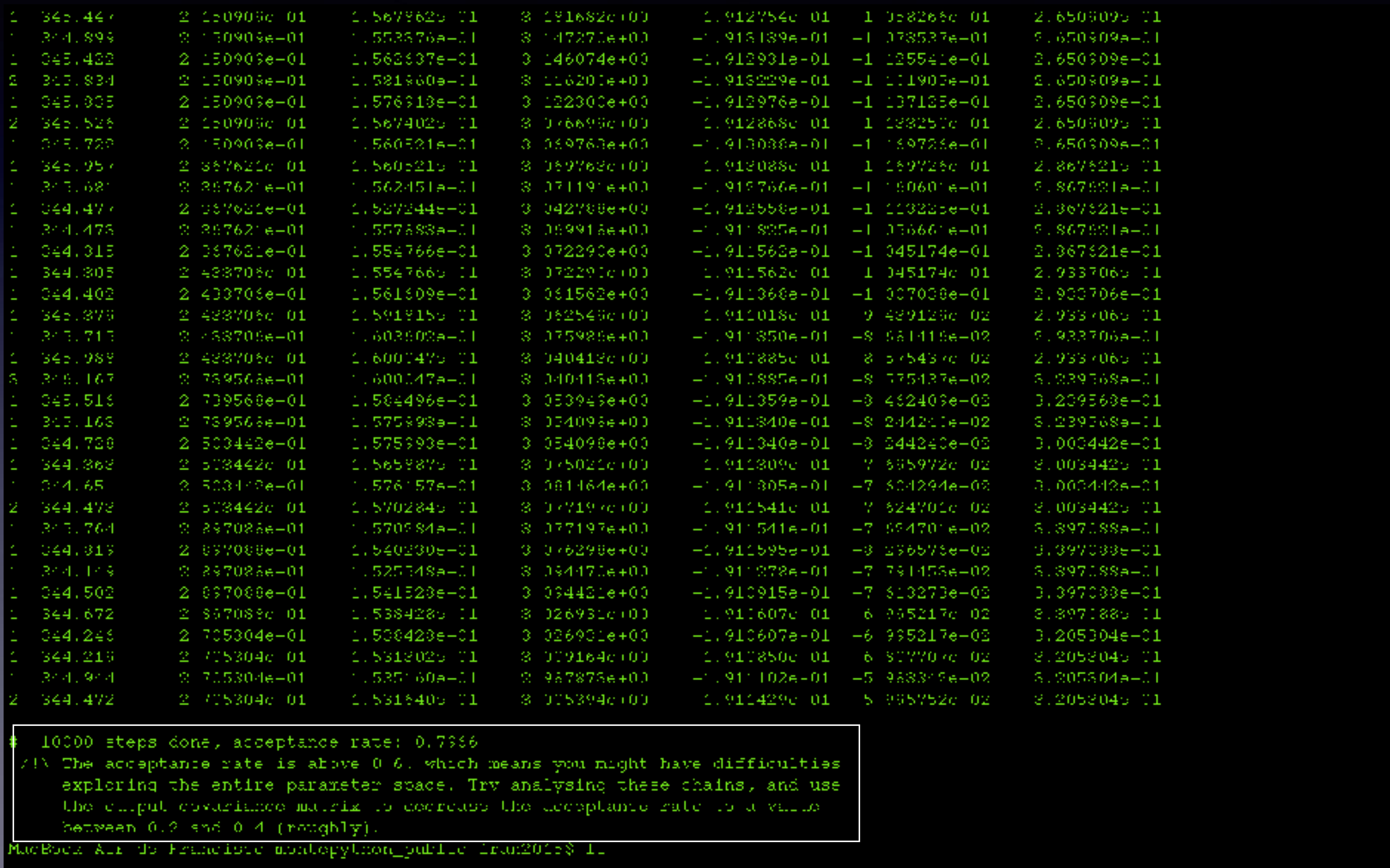
```
MacBook-Air-de-Francisco montepython_public fran2015$ montepython/MontePython.py run -p jla.param -o taller_cuerna -N 10000
Running Monte Python v2.2.2

with CLASS v2.5.0

Testing likelihoods for
 -> JLA

Creating taller_cuerna/2018-07-24_10000__1.txt

Deduced starting covariance matrix:
['Omega_cdm', 'alpha', 'beta', 'M', 'Delta_M']
[[ 6.40e-03   0.00e+00   0.00e+00   0.00e+00   0.00e+00]
 [ 0.00e+00   1.00e-04   0.00e+00   0.00e+00   0.00e+00]
 [ 0.00e+00   0.00e+00   4.00e-04   0.00e+00   0.00e+00]
 [ 0.00e+00   0.00e+00   0.00e+00   1.60e-03   0.00e+00]
 [ 0.00e+00   0.00e+00   0.00e+00   0.00e+00   1.60e-03]]

#  -logLkl    Omega_cdm      alpha          beta           M              Delta_M        Omega_m
1  372.511    2.444470e-01   1.500000e-01   3.559000e+00   -1.902000e+01  -1.000000e-01  2.944470e-01
3  370.629    2.444470e-01   1.510083e-01   3.545535e+00   -1.902538e+01  -9.579727e-02  2.944470e-01
1  370.699    2.444470e-01   1.519374e-01   3.564576e+00   -1.902704e+01  -1.002925e-01  2.944470e-01
1  368.141    2.714585e-01   1.519874e-01   3.564376e+00   -1.902704e+01  -1.002335e-01  3.214585e-01
1  364.492    2.714585e-01   1.508898e-01   3.565198e+00   -1.904020e+01  -1.043970e-01  3.214585e-01
1  364.373    2.714585e-01   1.491515e-01   3.555666e+00   -1.903783e+01  -9.988716e-02  3.214585e-01
1  364.208    2.714585e-01   1.497646e-01   3.541432e+00   -1.903665e+01  -9.393038e-02  3.214585e-01
2  363.809    2.714585e-01   1.474871e-01   3.523829e+00   -1.903500e+01  -9.004729e-02  3.214585e-01
1  361.276    2.714585e-01   1.469111e-01   3.469133e+00   -1.903474e+01  -8.903391e-02  3.214585e-01
1  364.888    2.714585e-01   1.456482e-01   3.509746e+00   -1.902966e+01  -8.199450e-02  3.214585e-01
1  365.306    2.714585e-01   1.457775e-01   3.525520e+00   -1.903138e+01  -8.370125e-02  3.214585e-01
1  362.593    2.714585e-01   1.459369e-01   3.502308e+00   -1.903470e+01  -9.072634e-02  3.214585e-01
1  360.772    3.102584e-01   1.459869e-01   3.502338e+00   -1.903470e+01  -9.072634e-02  3.602584e-01
1  360.008    3.102584e-01   1.479618e-01   3.472879e+00   -1.903786e+01  -8.014521e-02  3.602584e-01
1  360.099    3.102584e-01   1.480157e-01   3.481559e+00   -1.903657e+01  -8.388974e-02  3.602584e-01
1  360.327    3.102584e-01   1.466529e-01   3.457469e+00   -1.902823e+01  -8.596770e-02  3.602584e-01
3  358.174    3.102584e-01   1.453497e-01   3.439209e+00   -1.903279e+01  -8.322757e-02  3.602584e-01
1  357.791    3.102584e-01   1.450881e-01   3.418384e+00   -1.903206e+01  -8.397612e-02  3.602584e-01
1  357.974    3.102584e-01   1.449080e-01   3.381719e+00   -1.902542e+01  -8.438550e-02  3.602584e-01
1  357.379    3.102584e-01   1.460852e-01   3.391633e+00   -1.902972e+01  -8.433775e-02  3.602584e-01
```

$$\mu = 5\log_{10}(d_L/10pc))$$

$$\mu = m_B^\star - (M_B - \alpha \times X_1 + \beta \times C)$$

https://arxiv.org/pdf/1401.4064.pdf

Corriendo MontePython



Análisis de las cadenas

```
Running Monte Python v2.2.2

--> Scanning file taller_cuerna/2018-07-24_10000__1.txt   Removed 0 non-markovian points, 99 points of burn-in, keep 7897 steps
 /!\ Convergence computed for a single file
--> Computing mean values
--> Computing variance
--> Computing convergence criterium (Gelman-Rubin)
 -> R-1 is 0.000088      for   Omega_cdm
           0.000064      for   alpha
           0.000020      for   beta
           0.000080      for   M
           0.000190      for   Delta_M
           0.000088      for   Omega_m
 -> Computing histograms for  Omega_cdm
 /!\ The 1D posterior could not be processed normally, probably due to incomplete
     or obsolete numpy and/or scipy versions. So the raw histograms will be
     plotted.
 -> Computing histograms for  alpha
 -> Computing histograms for  beta
 -> Computing histograms for  M
 -> Computing histograms for  Delta_M
 -> Computing histograms for  Omega_m
-----------------------------------------------
--> Saving figures to .pdf files
--> Writing .info and .tex files
MacBook-Air-de-Francisco:montepython_public fran2015$ cd taller_cuerna/
```

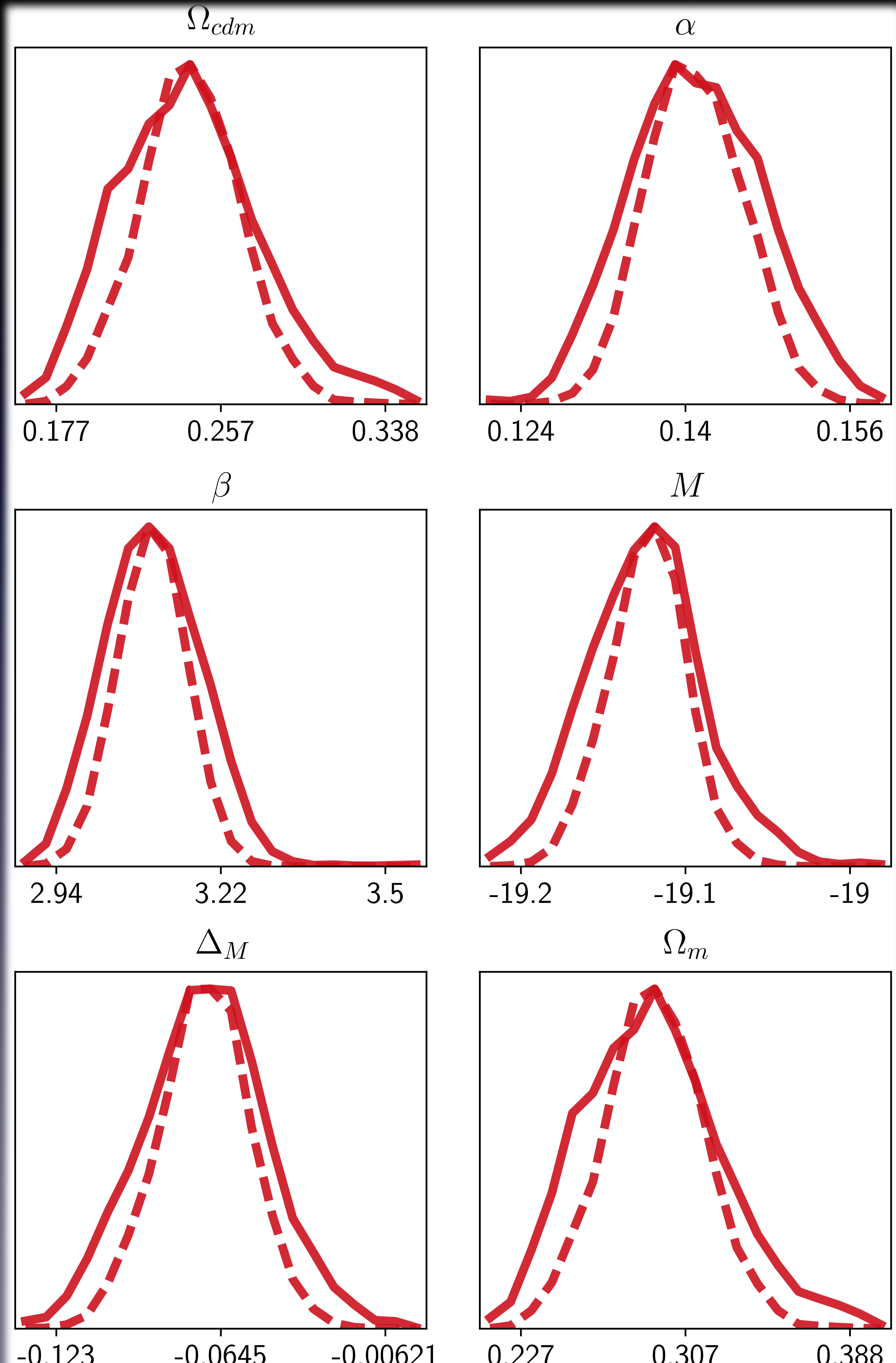
$$R - 1 < 0.01$$

$$s_j^2 = \frac{1}{n-1}\sum_{i=1}^{n}(\theta_{ij} - \bar{\theta}_j)^2 \qquad \bar{\bar{\theta}} = \frac{1}{m}\sum_{j=1}^{m}\bar{\theta}_j$$

$$W = \frac{1}{m}\sum_{j=1}^{m} s_j^2 \qquad B = \frac{n}{m-1}\sum_{j=1}^{m}(\bar{\theta}_j - \bar{\bar{\theta}})^2$$

$$V\hat{ar}(\theta) = \left(1 - \frac{1}{n}\right)W + \frac{1}{n}B \qquad \hat{R} = \sqrt{\frac{V\hat{ar}(\theta)}{W}}$$

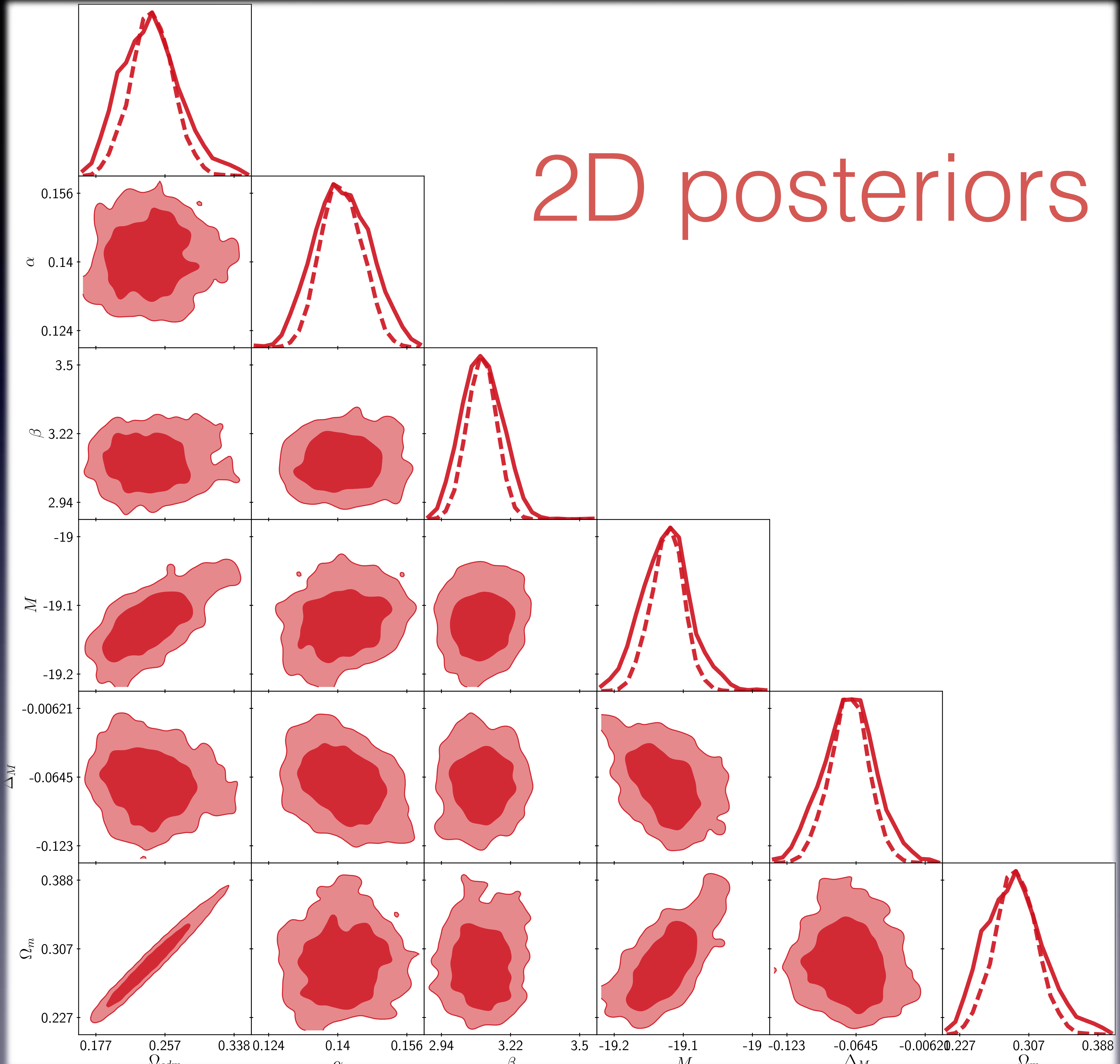
A. Gelman and D. B. Rubin, *Inference from Iterative Simulation Using Multiple Sequence*, 1992



1D posteriors (línea sólida)

Media (línea segmentada)

2D posteriors



Podemos correr nuevamente Monte Python con la matriz de covarianza y los bestfit de la corrida anterior:

```
montepython/MontePython.py run -p archivo_de_parámetros.param -o nuevo_archivo_de_salida -c archivo_de_salida/archivo_de_salida.covmat -b archivo_de_salida/archivo_de_salida.bestfit —N número_de_pasos
```

```
MacBook-Air-de-Francisco:montepython_public fran2015$ montepython/MontePython.py run -p jla.param -o taller_cuerna_covmat_bf -c ta
ller_cuerna/taller_cuerna.covmat -b taller_cuerna/taller_cuerna.bestfit -N 10000
Running Monte Python v2.2.2

with CLASS v2.5.0

Testing likelihoods for:
  > JLA

Creating taller_cuerna_covmat_bf/2018-07-24_10000__1.txt

Input covariance matrix:
['Omega_cdm', 'alpha', 'beta', 'M', 'Delta_M', 'Omega_m']
[[  1.15e-03   1.19e-05   1.86e-04   6.06e-04  -1.10e-04   1.16e-03]
 [  1.19e-05   4.15e-05   1.50e-05   3.90e-05  -4.60e-05   1.19e-05]
 [  1.86e-04   1.50e-05   6.56e-03   3.79e-04  -6.00e-05   1.86e-04]
 [  6.06e-04   3.90e-05   3.79e-04   6.54e-04  -2.40e-04   6.06e-04]
 [ -1.10e-04  -4.60e-05  -6.00e-05  -2.40e-04   4.83e-04  -1.10e-04]
 [  1.15e-03   1.19e-05   1.86e-04   6.06e-04  -1.10e-04   1.16e-03]]

First treatment (scaling)
['Omega_cdm', 'alpha', 'beta', 'M', 'Delta_M', 'Omega_m']
[[  1.15e-03   1.19e-05   1.86e-04   6.06e-04  -1.10e-04   1.16e-03]
 [  1.19e-05   4.15e-05   1.50e-05   3.90e-05  -4.60e-05   1.19e-05]
 [  1.86e-04   1.50e-05   6.56e-03   3.79e-04  -6.00e-05   1.86e-04]
 [  6.06e-04   3.90e-05   3.79e-04   6.54e-04  -2.40e-04   6.06e-04]
 [ -1.10e-04  -4.60e-05  -6.00e-05  -2.40e-04   4.83e-04  -1.10e-04]
 [  1.15e-03   1.19e-05   1.86e-04   6.06e-04  -1.10e-04   1.16e-03]]

Second treatment (partial reordering and cleaning)
['Omega_cdm', 'alpha', 'beta', 'M', 'Delta_M', '']
[[  1.15e-03   1.19e-05   1.86e-04   6.06e-04  -1.10e-04   0.00e+00]
 [  1.19e-05   4.15e-05   1.50e-05   3.90e-05  -4.60e-05   0.00e+00]
 [  1.86e-04   1.50e-05   6.56e-03   3.79e-04  -6.00e-05   0.00e+00]
 [  6.06e-04   3.90e-05   3.79e-04   6.54e-04  -2.40e-04   0.00e+00]
 [ -1.10e-04  -4.60e-05  -6.00e-05  -2.40e-04   4.83e-04   0.00e+00]
 [  0.00e+00   0.00e+00   0.00e+00   0.00e+00   0.00e+00   0.00e+00]]

Deduced starting covariance matrix:
```

```
Starting point for rescaled parameters:
from best-fit file     Omega_cdm  =  0.289287
from best fit file     alpha  =  0 141226
from best-fit file     beta  -  3 11025
from best-fit file     M  =  -19.127
from best-fit file     Delta_M  _  -0.0752836
```

4	LogLkl	Omega_cdm	alpha	beta	M	Delta_M	Omega_m
3	341.497	2.494796e-01	1.413309e-01	3.111889e+00	-1.912166e+01	-7.625743e-02	2.994796e-01
3	342.625	2.494796e-01	1.407051e-01	3.088931e+00	-1.913859e+01	-8.119206e-02	2.994796e-01
5	342.851	2.494796e-01	1.478928e-01	2.997551e+00	-1.912452e+01	-6.248664e-02	2.994796e-01
3	342.555	2.494796e-01	1.335445e-01	3.130064e+00	-1.913112e+01	-4.170455e-02	2.994796e-01
2	342.894	2.494796e-01	1.312594e-01	3.151776e+00	-1.912567e+01	-7.277081e-02	2.994796e-01
15	342.149	2.494796e-01	1.377626e-01	3.117654e+00	-1.911960e+01	-9.016119e-02	2.994796e-01
2	343.016	2.494796e-01	1.355490e-01	3.111129e+00	-1.912188e+01	-1.066655e-01	2.994796e-01
1	343.548	2.494796e-01	1.335138e-01	3.177629e+00	-1.914705e+01	-6.577034e-02	2.994796e-01
2	343.198	2.494796e-01	1.400691e-01	3.171517e+00	-1.912812e+01	-9.823386e-02	2.994796e-01
3	342.04	2.494796e-01	1.353902e-01	3.123336e+00	-1.911847e+01	-7.804075e-02	2.994796e-01
1	343.885	2.494796e-01	1.357749e-01	3.188263e+00	-1.913452e+01	-9.530158e-02	2.994796e-01
2	343.534	2.571709e-01	1.358860e-01	3.185092e+00	-1.911529e+01	-9.697192e-02	3.071709e-01
1	343.899	2.571709e-01	1.443733e-01	3.235560e+00	-1.909593e+01	-9.775732e-02	3.071709e-01
1	345.068	2.571709e-01	1.418685e-01	3.227554e+00	-1.907720e+01	-9.075178e-02	3.071709e-01
1	346.159	2.571709e-01	1.477775e-01	3.144406e+00	-1.907959e+01	-1.367593e-01	3.071709e-01
3	345.372	2.350852e-01	1.474491e-01	3.189275e+00	-1.909632e+01	-1.337299e-01	2.850852e-01
1	344.27	2.350852e-01	1.378258e-01	3.167601e+00	-1.912759e+01	-1.109848e-01	2.850852e-01
2	344.353	2.350852e-01	1.375878e-01	3.236687e+00	-1.911944e+01	-1.055651e-01	2.850852e-01
2	344.649	2.350852e-01	1.430198e-01	3.267837e+00	-1.911816e+01	-1.060768e-01	2.850852e-01
2	343.595	2.350852e-01	1.440836e-01	3.226708e+00	-1.910700e+01	-9.977382e-02	2.850852e-01
3	344.771	1.816435e-01	1.435369e-01	3.210162e+00	-1.913485e+01	-9.472790e-02	2.316435e-01
2	345.008	1.816435e-01	1.378284e-01	3.187492e+00	-1.914872e+01	-9.798149e-02	2.316435e-01
8	344.586	2.867044e-01	1.383035e-01	3.204292e+00	-1.908795e+01	-1.070009e-01	3.367044e-01
4	346.208	2.867044e-01	1.335033e-01	3.051712e+00	-1.913750e+01	-8.017555e-02	3.367044e-01
3	342.993	2.867044e-01	1.374407e-01	3.172971e+00	-1.910875e+01	-8.185118e-02	3.367044e-01
2	344.113	3.116137e-01	1.379553e-01	3.176954e+00	-1.909576e+01	-8.420302e-02	3.616137e-01
4	344.046	3.116137e-01	1.398630e-01	3.091626e+00	-1.908787e+01	-5.308135e-02	3.616137e-01
1	345.108	3.116137e-01	1.382089e-01	3.165327e+00	-1.909288e+01	-3.976341e-02	3.616137e-01
5	345.478	3.116137e-01	1.368780e-01	3.158137e+00	-1.911504e+01	-2.781459e-02	3.616137e-01
4	344.292	3.116137e-01	1.347003e-01	3.134808e+00	-1.907935e+01	-7.699579e-02	3.616137e-01
3	344.736	3.116137e-01	1.437384e-01	3.143502e+00	-1.908062e+01	-1.091810e-01	3.616137e-01
6	343.754	3.116137e-01	1.441575e-01	3.107552e+00	-1.908098e+01	-8.937254e-02	3.616137e-01

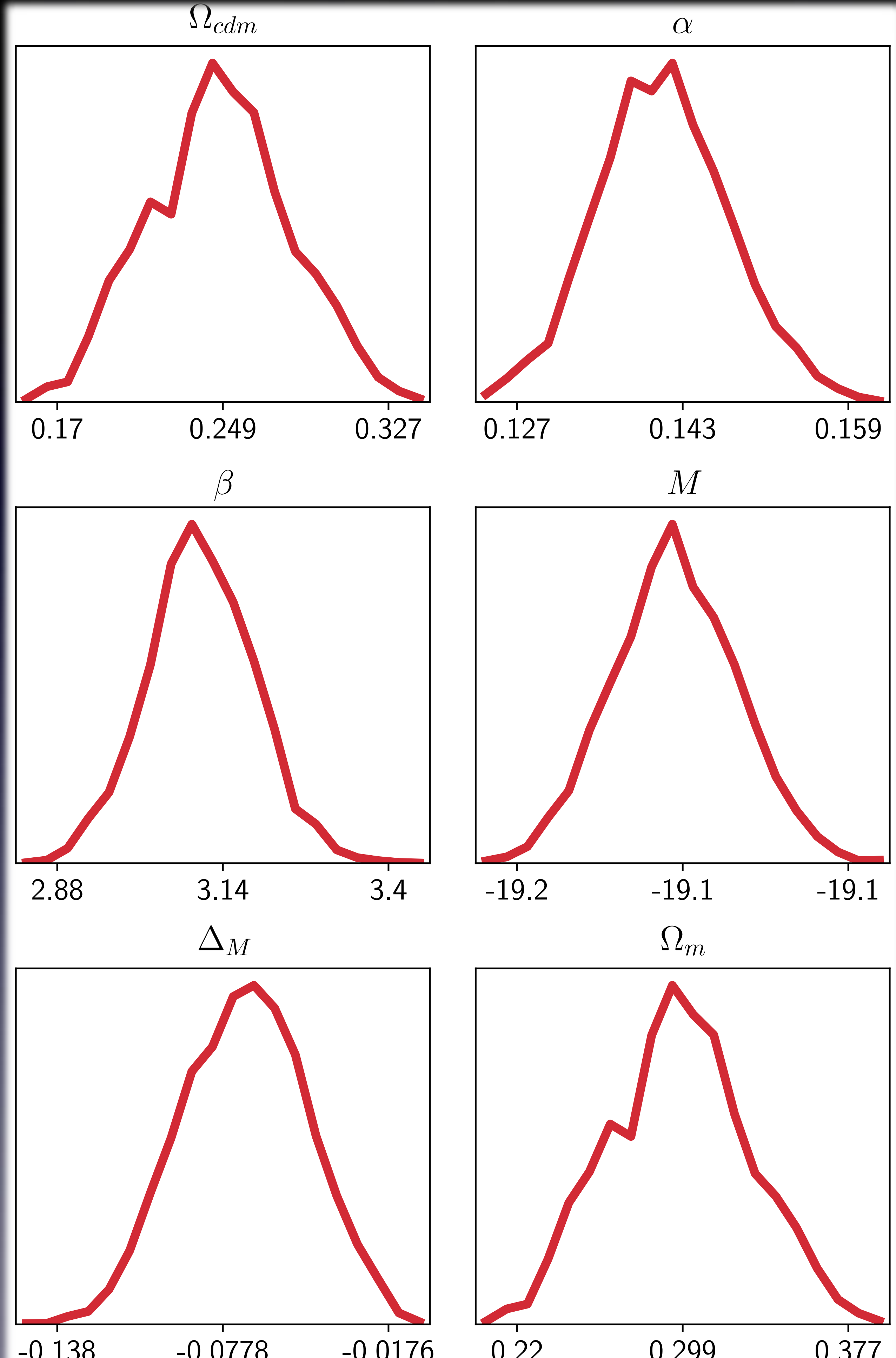
```
0  345.054    2.723615e-01   1.515529e-01   3.149020e+00   -1.913006e+01  -4.057457e-02   3.223615e-01
1  345.398    2.723615e-01   1.501058e-01   3.248947e+00   -1.912658e+01  -6.232450e-02   3.223615e-01
6  348.935    2.723615e-01   1.495606e-01   3.335465e+00   -1.912775e+01   9.379154e-02   3.223615e-01
5  348.15     2.206546e-01   1.490314e-01   3.327196e+00   -1.915471e+01  -8.690951e-02   2.706546e-01
6  349.854    1.672499e-01   1.484850e-01   3.318657e+00   -1.918255e+01  -8.386734e-02   2.172499e-01
2  347.010    1.672499e-01   1.507417e-01   3.222930e+00   -1.913527e+01  -1.068369e-01   2.172499e-01
3  348.001    1.672499e-01   1.424271e-01   3.300695e+00   -1.913283e+01  -1.054360e-01   2.172499e-01
2  348.813    1.672499e-01   1.442311e-01   3.311827e+00   -1.914177e+01   1.103668e-01   2.172499e-01
4  348.725    1.672499e-01   1.353566e-01   3.211873e+00   -1.918280e+01  -9.505694e-02   2.172499e-01
5  346.866    1.672499e-01   1.408714e-01   3.170007e+00   -1.917391e+01  -9.430419e-02   2.172499e-01
2  346.507    1.672499e-01   1.397768e-01   3.029857e+00   -1.918950e+01   6.390206e-02   2.172499e-01
1  346.051    1.672499e-01   1.427299e-01   2.990956e+00   -1.915850e+01  -9.575093e-02   2.172499e-01
2  346.22     1.744517e-01   1.428036e-01   2.992147e+00   -1.915514e+01  -9.613089e-02   2.244517e-01
2  344.996    1.744517e-01   1.410962e-01   3.016494e+00   -1.915819e+01   7.704295e-02   2.244517e-01
11  344.055   1.744517e-01   1.372829e-01   3.054891e+00   -1.915720e+01  -7.837134e-02   2.244517e-01
2  342.074    2.599399e-01   1.381577e-01   3.068561e+00   -1.911867e+01  -8.644374e-02   3.099399e-01
2  342.397    2.599399e-01   1.378006e-01   3.162000e+00   -1.910312e+01   8.293172e-02   3.099399e-01
2  343.072    2.599399e-01   1.352288e-01   3.222235e+00   -1.912091e+01  -5.992539e-02   3.099399e-01
5  342.657    2.599399e-01   1.389704e-01   3.195538e+00   -1.910417e+01  -8.478428e-02   3.099399e-01
5  343.351    2.599399e-01   1.304992e-01   3.130713e+00   -1.911592e+01  -4.646854e-02   3.099399e-01
1  342.402    2.599399e-01   1.358783e-01   3.130369e+00   -1.910591e+01  -5.938422e-02   3.099399e-01
1  342.859    2.599399e-01   1.390158e-01   3.195829e+00   -1.911886e+01   6.590597e-02   3.099399e-01
1  342.233    2.599399e-01   1.444267e-01   3.123375e+00   -1.910215e+01  -7.293409e-02   3.099399e-01
2  341.835    2.599399e-01   1.417011e-01   3.103557e+00   -1.910388e+01  -7.369534e-02   3.099399e-01
6  345.909    2.599399e-01   1.259598e-01   3.108065e+00   -1.911229e+01   9.822085e-02   3.099399e-01
4  345.359    2.599399e-01   1.334204e-01   3.116508e+00   -1.909381e+01  -1.184150e-01   3.099399e-01
2  344.624    2.599399e-01   1.470105e-01   3.083450e+00   -1.908825e+01  -1.199159e-01   3.099399e-01
5  343.81     2.599399e-01   1.415101e-01   3.101978e+00   -1.909061e+01   1.061408e-01   3.099399e-01
6  343.095    2.599399e-01   1.408222e-01   3.122540e+00   -1.910410e+01  -1.092401e-01   3.099399e-01
3  343.864    2.599399e-01   1.480964e-01   3.055613e+00   -1.911699e+01  -1.138434e-01   3.099399e-01
6  342.541    2.599399e-01   1.383498e-01   3.048531e+00   -1.913811e+01   7.057216e-02   3.099399e-01
2  345.255    2.599399e-01   1.290373e-01   3.041445e+00   -1.914150e+01  -7.578381e-02   3.099399e-01
2  345.406    2.427075e-01   1.288609e-01   3.038690e+00   -1.915048e+01  -7.816183e-02   2.927075e-01
2  345.21     2.427075e-01   1.262100e-01   3.004624e+00   -1.912757e+01   5.991553e-02   2.927075e-01
2  345.481    2.427075e-01   1.317940e-01   3.225129e+00   -1.909304e+01  -8.317738e-02   2.927075e-01
2  347.588    2.427075e-01   1.342198e-01   3.256991e+00    1.910979e+01  -5.487958e-02   2.927075e-01
2  343.487    2.427075e-01   1.419755e-01   3.12323                                       7075e-01

4  10000 steps done, acceptance rate  0.3251
MacBook-Air-de-Francisco:montepython_public fran2015$
```

entre 0.2 y 0.4

Luego podemos analizar las cadenas y pedir que no se grafique la media:

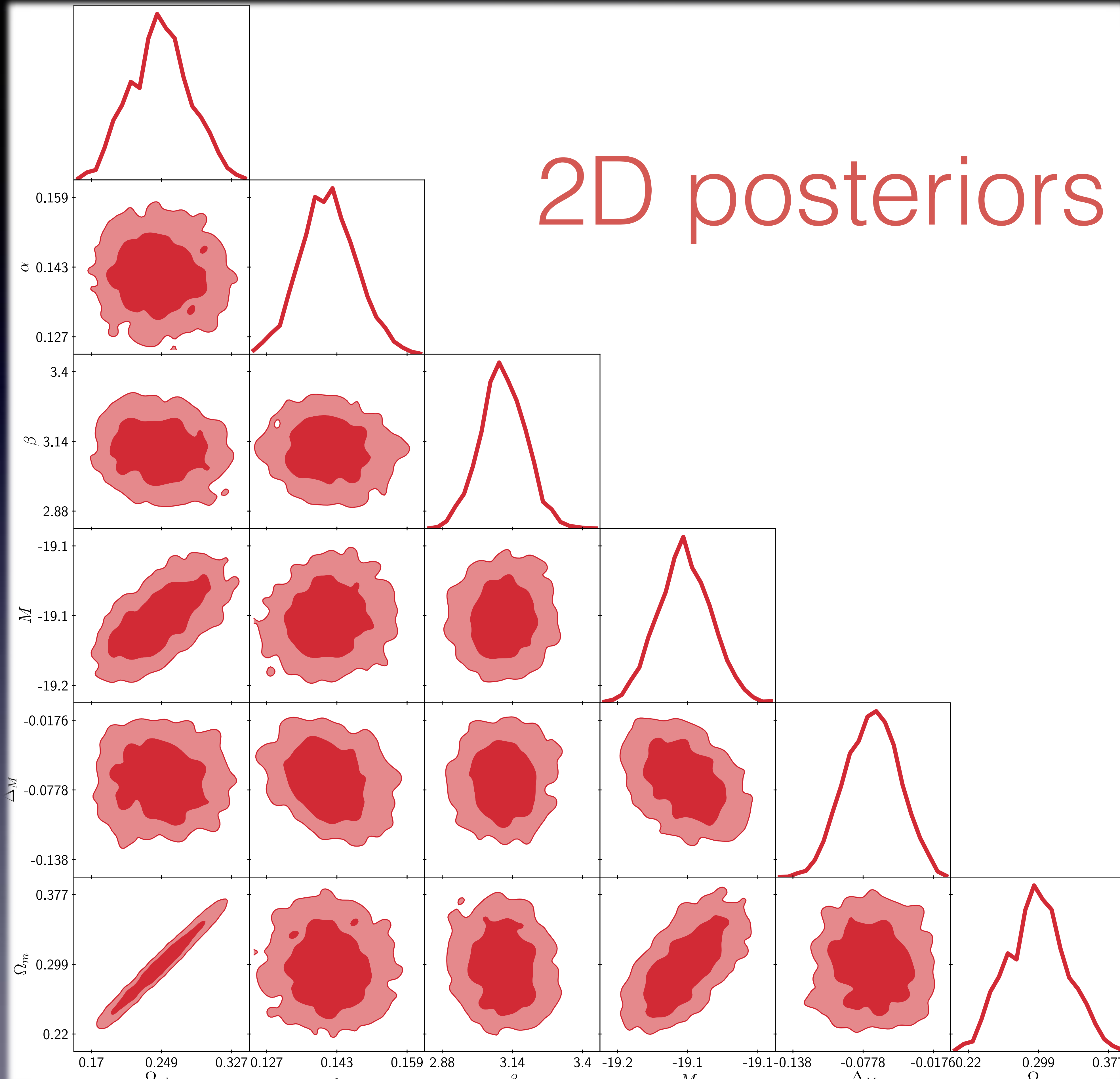
```
montepython/MontePython.py info archivo_de_salida --want-covmat --no-mean
```

```
MacBook-Air-de-Francisco:montepython_public fran2015$ montepython/MontePython.py info taller_cuerna_covmat_bf/ --want-covmat --no-
mean
Running Monte Python v2.2.2

 --> Scanning file taller_cuerna_covmat_bf/2018-07-24_10000__1.txt : Removed 0 non-markovian points, 0 points of burn-in, keep 3252
 steps
 /!\ Convergence computed for a single file
 --> Computing mean values
--> Computing variance
--> Computing convergence criterium (Gelman-Rubin)
 --> R-1 is 0.000383      for   Omega_cdm
            0.000350      for   alpha
            0.000465      for   beta
            0.000195      for   M
            0.000748      for   Delta_M
            0.000388      for   Omega_m
--> Computing covariance matrix
----------------------------------------------
 --> Computing histograms for   Omega_cdm
 /!\ The 1D posterior could not be processed normally, probablydue to incomplete
     or obsolete numpy and/or scipy versions So the raw histograms will be
     plotted.
 --> Computing histograms for   alpha
 --> Computing histograms for   beta
 --> Computing histograms for   M
 --> Computing histograms for   Delta_M
 --> Computing histograms for   Omega_m

--> Saving figures to .pdf files
--> Writing .info and .tex files
MacBook-Air-de-Francisco:montepython_public fran2015$
```



1D posteriors

2D posteriors



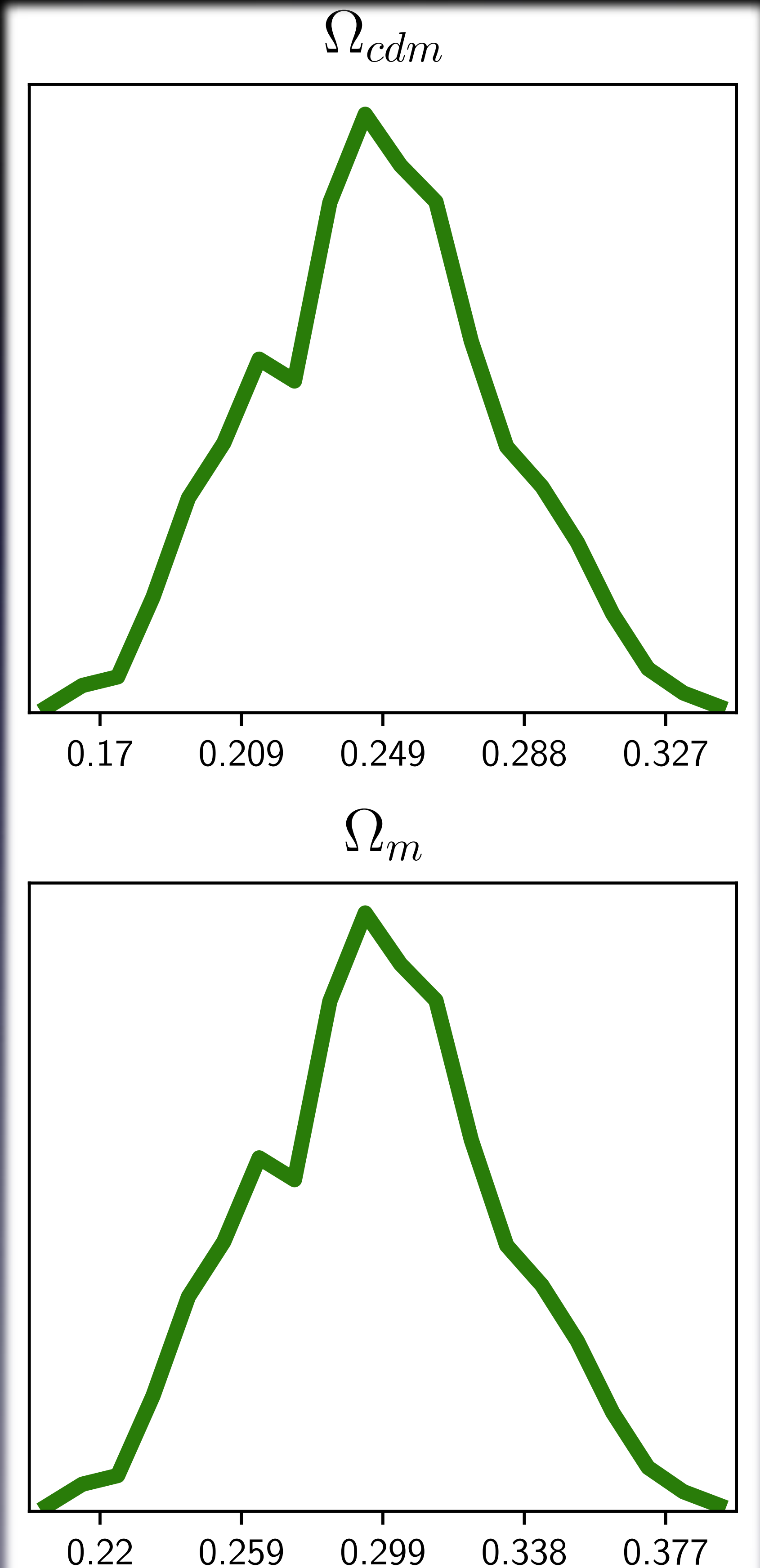
Si queremos mostrar solo los posteriors de los parámetros que nos interesen, ir a la carpeta

`montepython_public/plot_files`

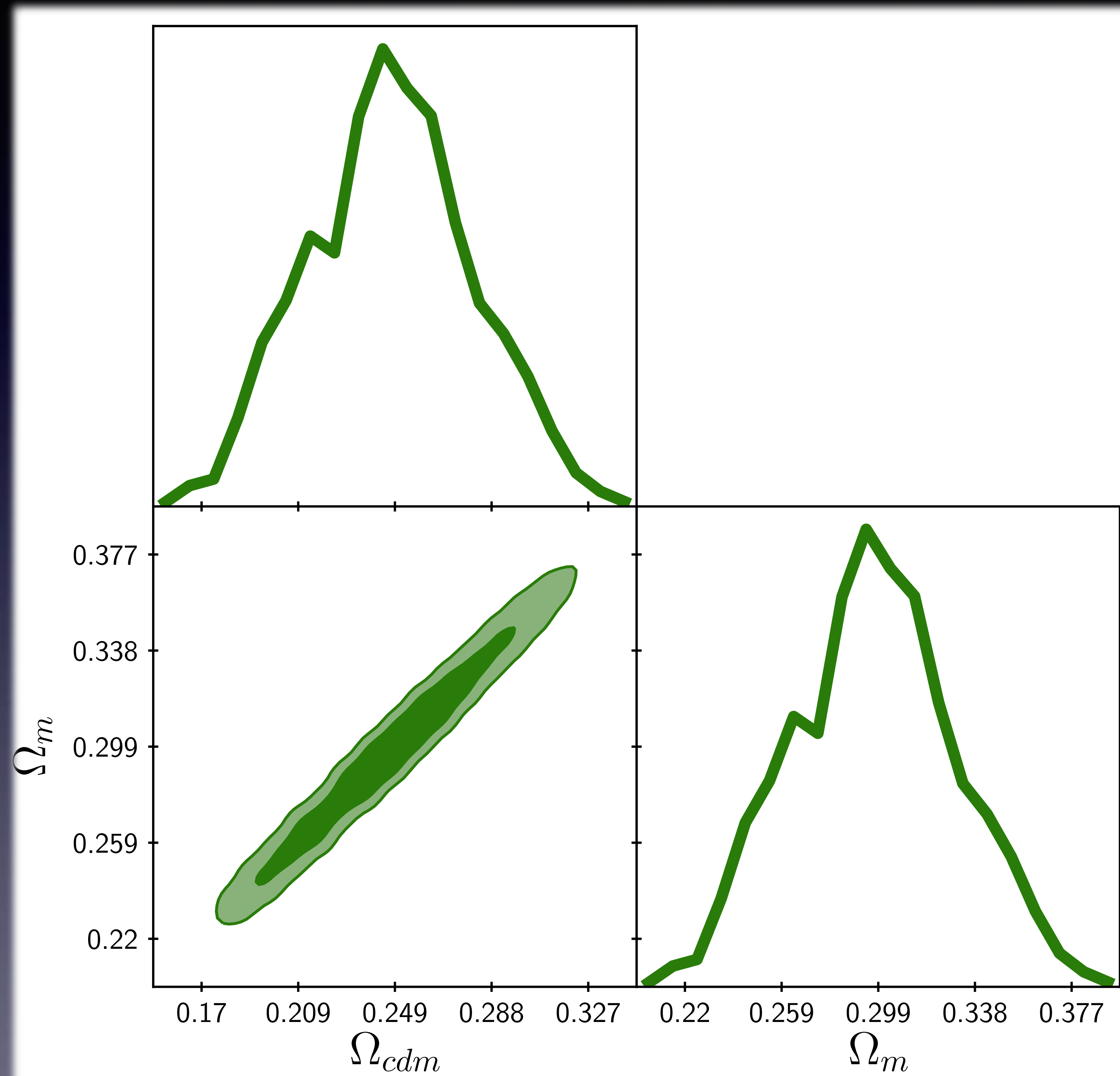
copiar el archivo `example.plot`
renombrarlo: `new_example.plot`

Una vez modificado el archivo `new_example.plot`, ejecutar el comando **`info`** añadiendo lo siguiente:

```
montepython/MontePython.py info archivo_de_salida --want-covmat --no-mean
--extra plot_files/new_example.plot
```



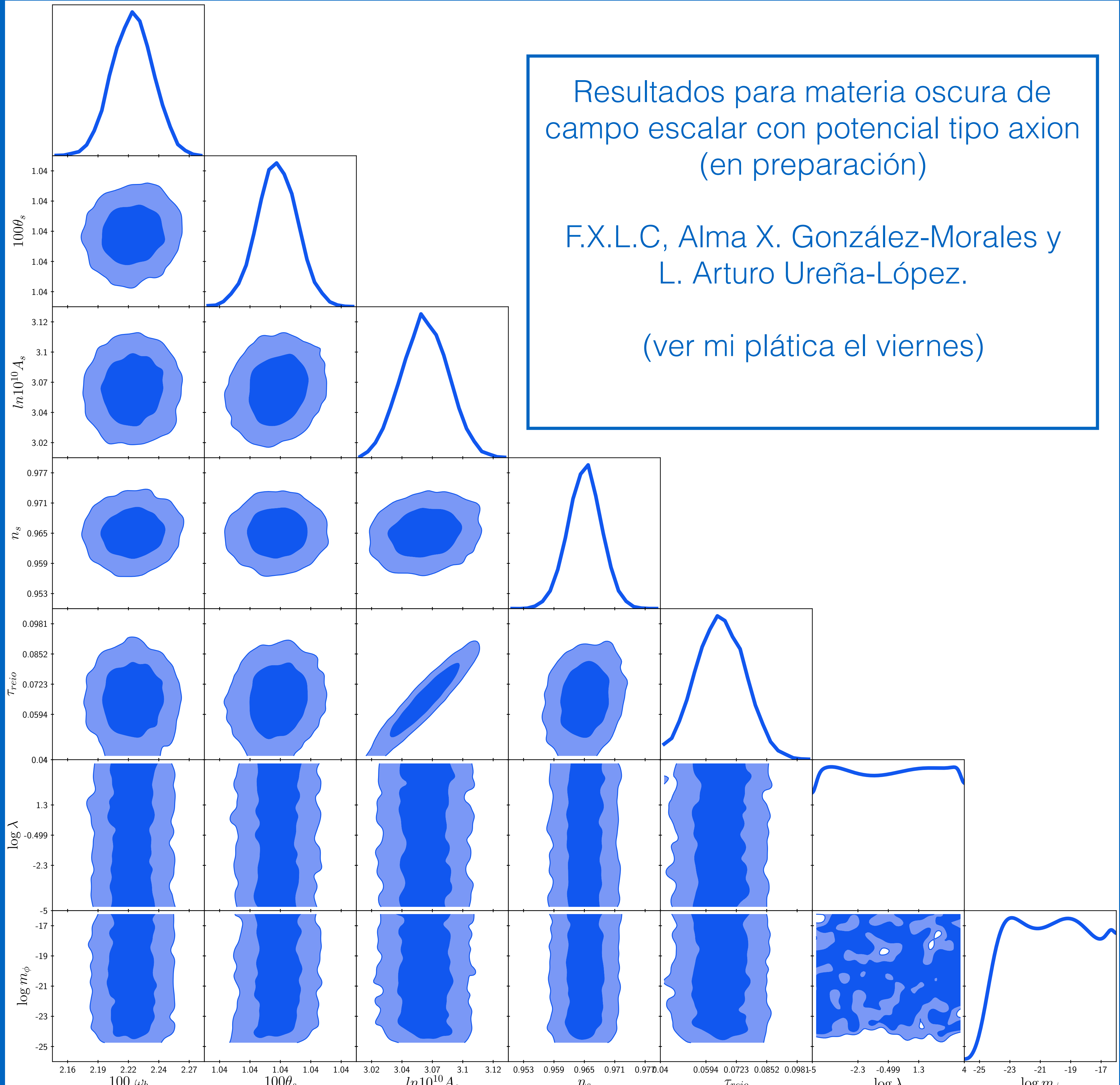
Ω_{cdm}
0.17
0.209
0.249
0.288
0.327
Ω_m
0.22
0.259
0.299
0.338
0.377



Ω_m
0.377
0.338
0.299
0.259
0.22
0.17
0.209
0.249
0.288
0.327
Ω_{cdm}
0.22
0.259
0.299
0.338
0.377
Ω_m

Añadiendo nuevos parámetros (Ejemplo con Planck)

- Añadir los parámetros de interés en el archivo `.param` correspondiente.
- De ser necesario, modificar el archivo `data.py`



Resultados para materia oscura de campo escalar con potencial tipo axion (en preparación)

F.X.L.C, Alma X. González-Morales y L. Arturo Ureña-López.

(ver mi plática el viernes)

Más opciones

How to find the help

`python montepython/MontePython.py -h`, and
`python montepython/MontePython.py run -h`,
`python montepython/MontePython.py info -h`.

For Metropolis Hastings

- `-N`: number of steps **asked**.
- `-c`: covariance matrix (`.covmat` file)
- `-b`: best-fit file (`.bestfit` file)
- `-j` jumping method (`fast` for Cholesky)
- `-f` jumping factor (default `2.4`)

Changing methods

- `-m` sampling method (`MH, NS, CH, IS`)

Benjamin Audren, *Advanced usage of Monte Python*, 2014

MontePython 3: boosted MCMC sampler and other features

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Abstract

MontePython is a parameter inference package for cosmology. We present the latest development of the code over the past couple of years. We explain, in particular, two new ingredients both contributing to improve the performance of Metropolis-Hastings sampling: an adaptation algorithm for the jumping factor, and a calculation of the inverse Fisher matrix, which can be used as a proposal density. We present several examples to show that these features speed up convergence and can save many hundreds of CPU-hours in the case of difficult runs, with a poor prior knowledge of the covariance matrix. We also summarise all the functionalities of MontePython in the current release, including new likelihoods and plotting options.

Keywords: Cosmology: –parameter inference, –numerical tools

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https://arxiv.org/abs/1804.07261