

Impacts of new LT1

Only 2MOM_noLF_n1 is shown, but results are similar for all configs.

Problems

- Looks like collection of rain by ice is increased
 - Reduction of liquid (in general)
 - Increase in solid (especially graupel)
- In 1D:
 - All 2 categories results look horrible with the latest 5.2.0 (to become 5.3.0)
 - The problems is the combination of the new LT1 and the new way to compute the diameter

New LT1

- Problem: mu_r =0 in the code, but not in the LT1 for ice-rain collection process → it is still using the old formulation.

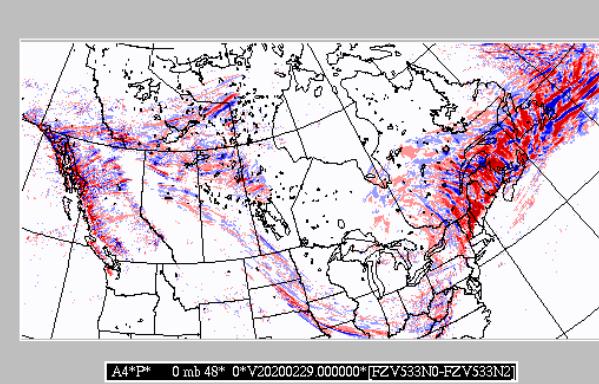
New version:
6.4-2moml
6.4-3moml

```
! get mu_r from lamr:  
! dum = 1./lamv  
  
! if (dum.lt.282.e-6) then  
!   mu_r = 8.282  
! elseif (dum.ge.282.e-6 .and. dum.lt.502.e-6) then  
!   ! interpolate:  
!     rdumii = (dum-250.e-6)*1.e6*0.5  
!     rdumii = max(rdumii,1.)  
!     rdumii = min(rdumii,150.)  
!     dumii = int(rdumii)  
!     dumii = min(149,dumii)  
!     mu_r = mu_r_table(dumii)+(mu_r_table(dumii+1)-  
mu_r_table(dumii))*(rdumii-real(dumii))  
! elseif (dum.ge.502.e-6) then  
!   mu_r = 0.  
! endif  
mu_r = 0.
```

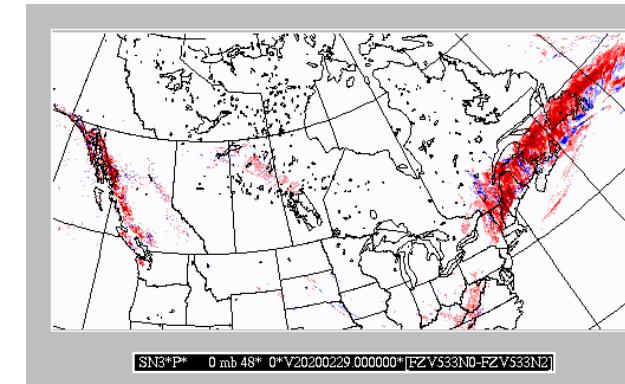
Impacts of new
LT1 – freezing
rain case
2MOM_noLF_n1



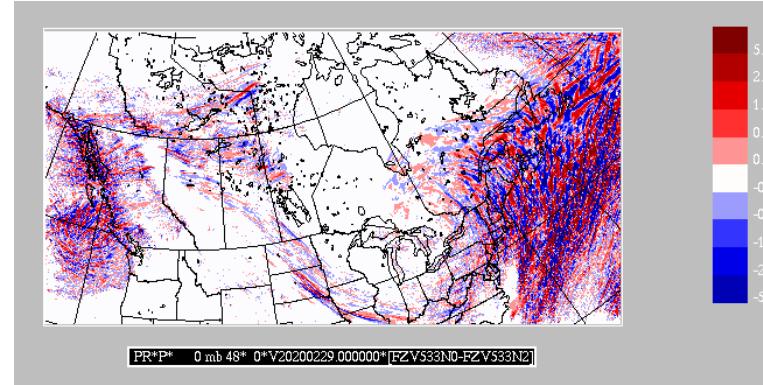
Total ice



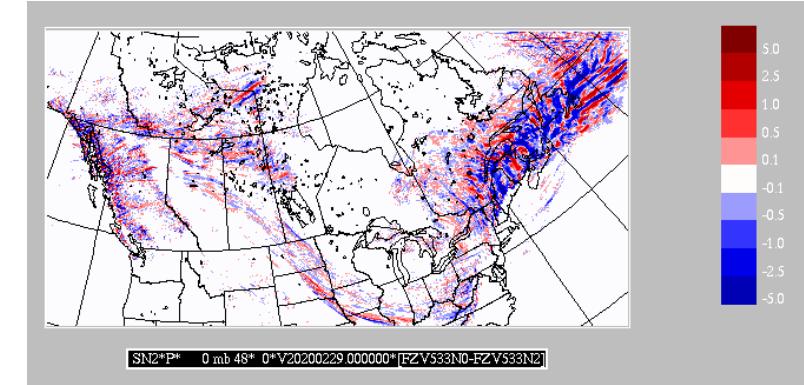
Graupel



Total



Snow

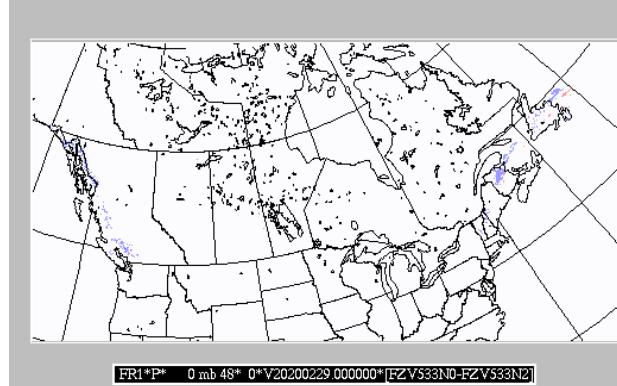


Impacts of new
LT1 – freezing
rain case
2MOM_noLF_n1

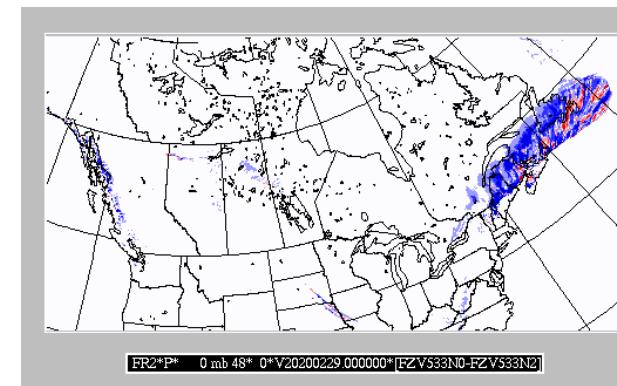


Same results for:
3MOM and LF

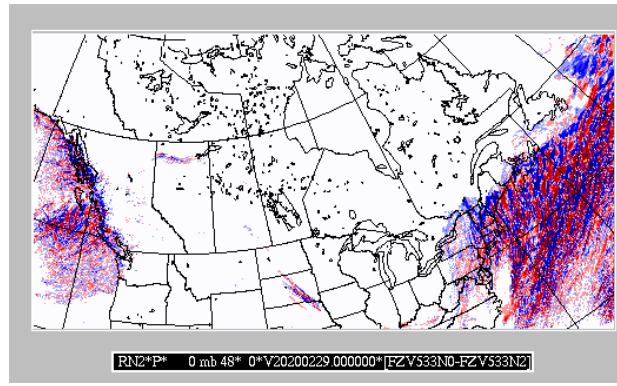
Freezing drizzle



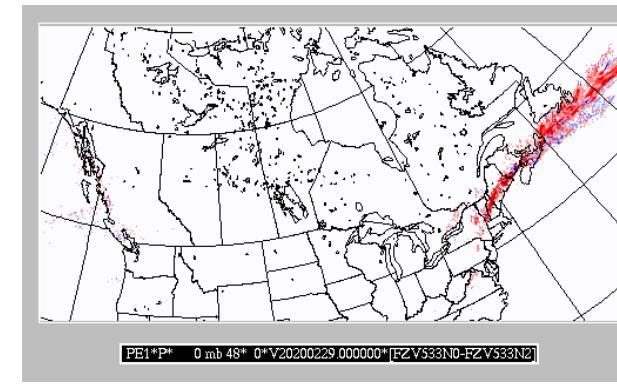
Freezing rain



rain



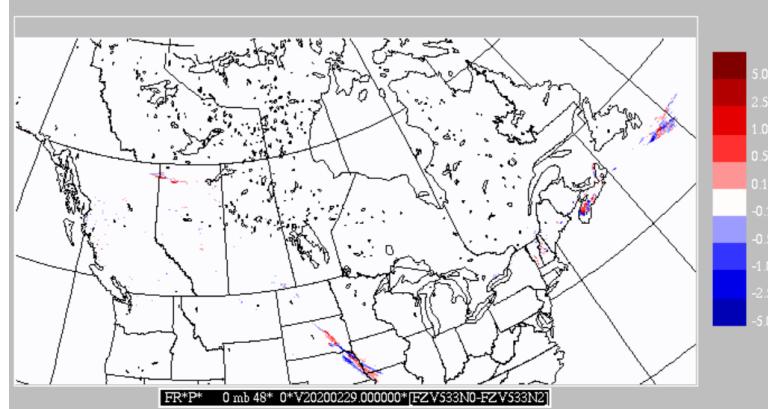
Ice pellets



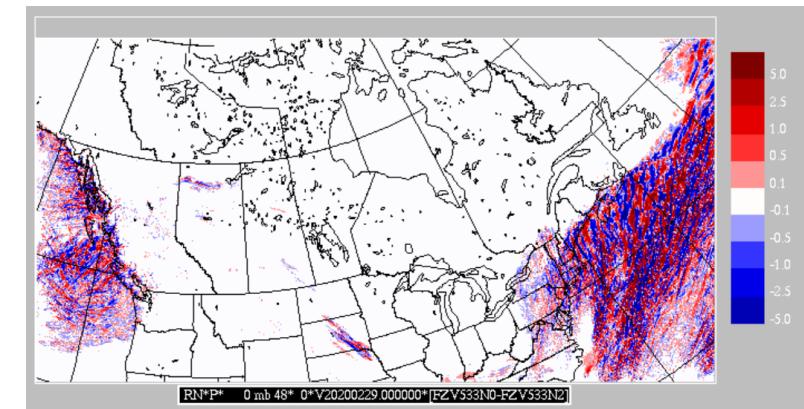
Impacts of new
LT1 – freezing
rain case
2MOM_noLF_n1



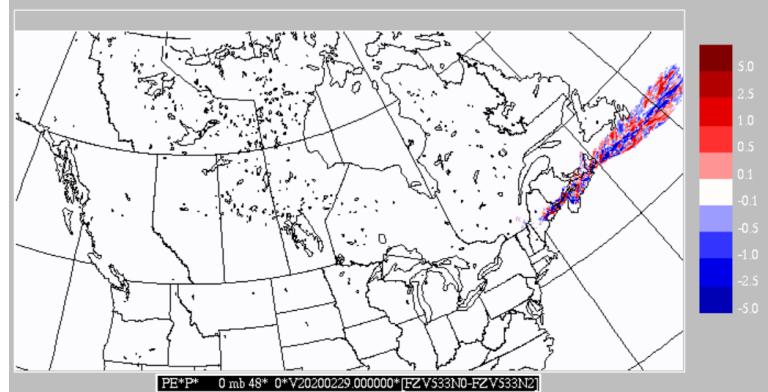
FR



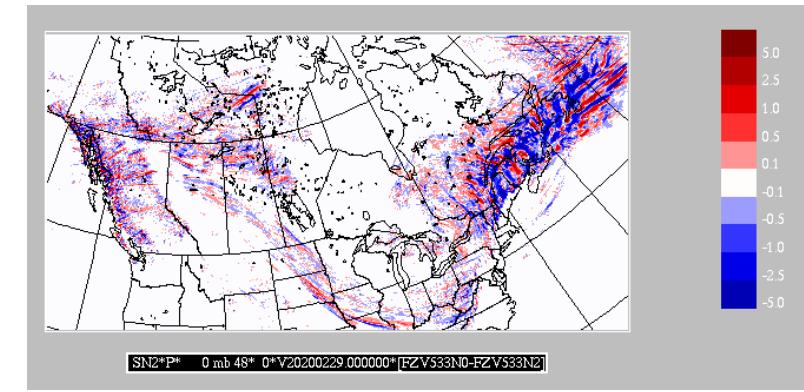
RN



PE

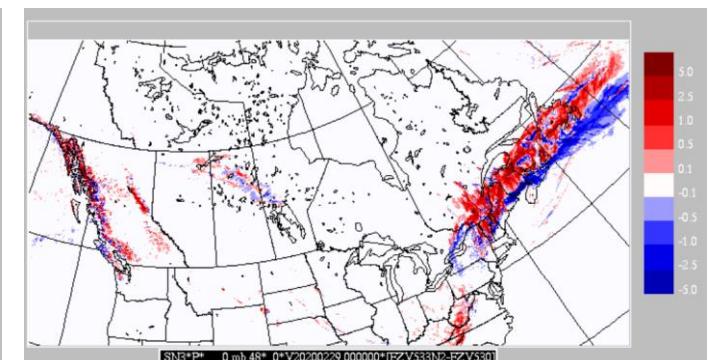
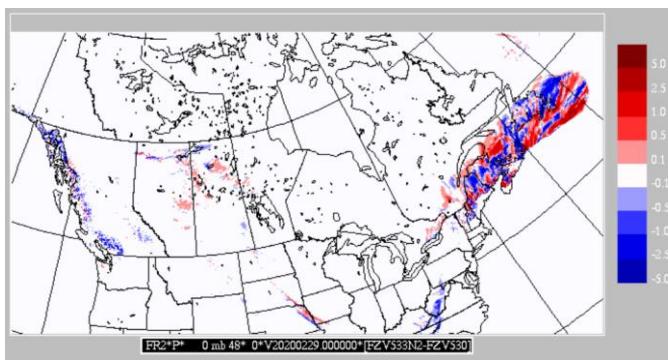
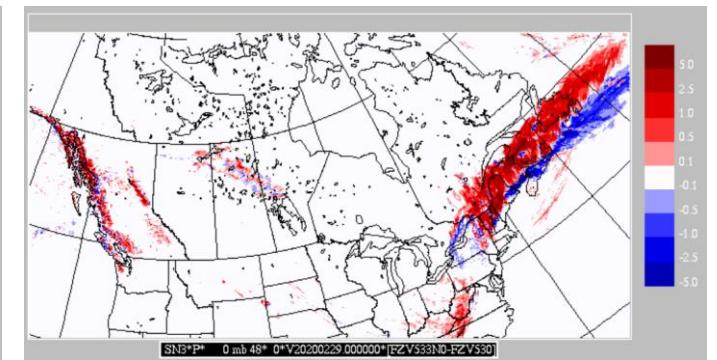
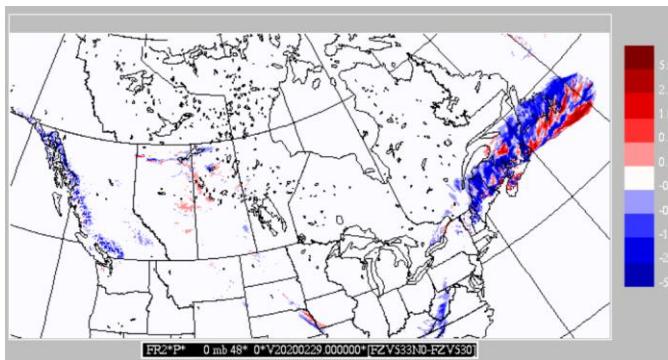


SN



Compared to v3

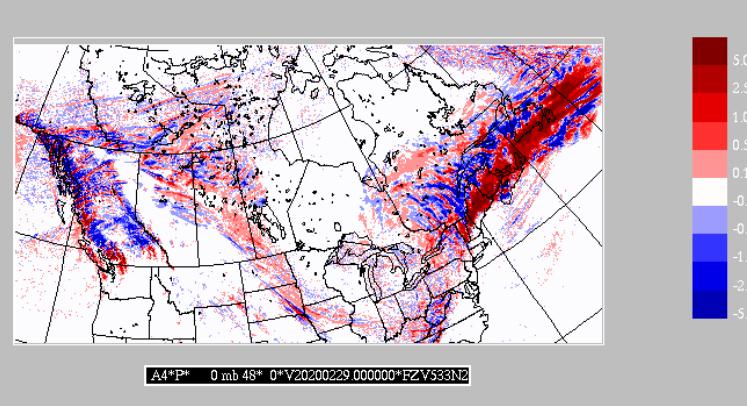
- Compared, changes are similar with old and new lookup table.
- Except for FR2 which is more decrease and SN3 that is more increased.



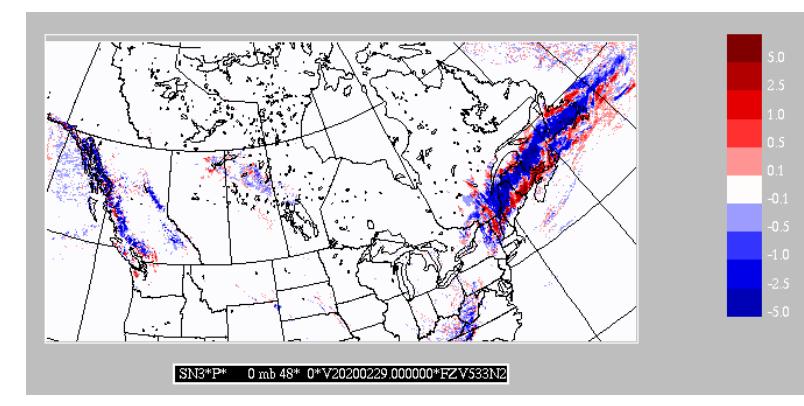
Impacts of new
LT1 – freezing
rain case
2MOM_noLF_n2



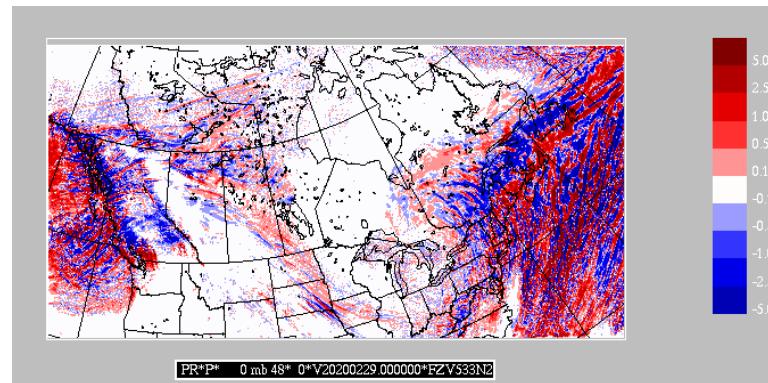
Total ice



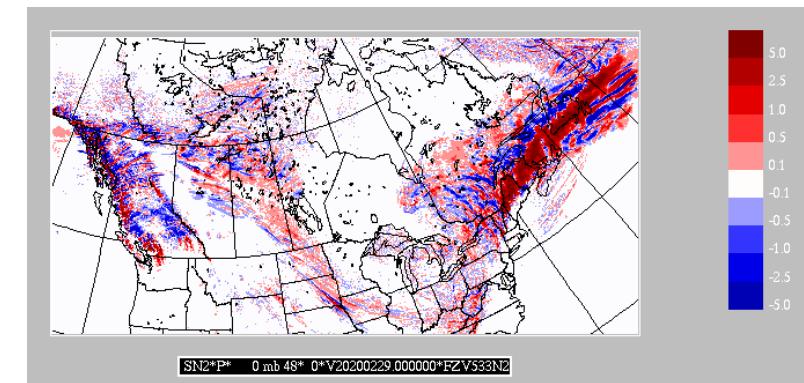
Graupel



Total



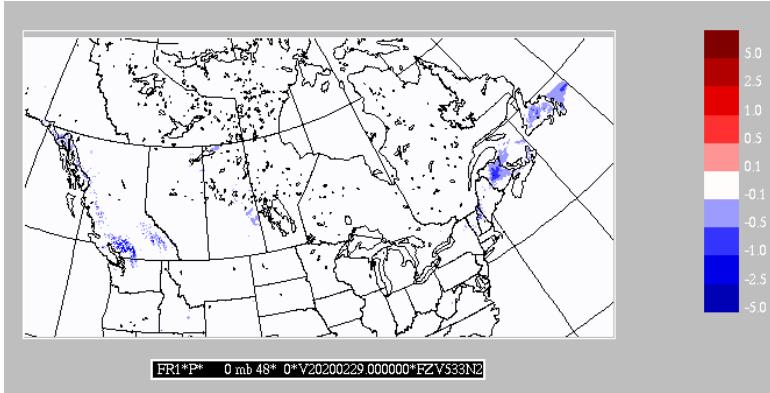
Snow



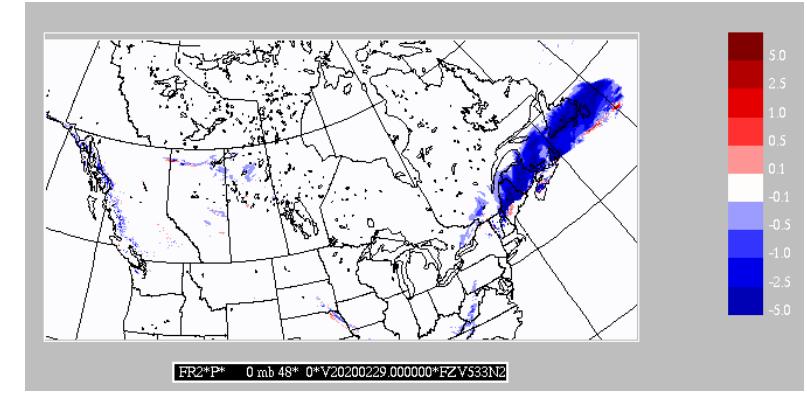
Impacts of new
LT1 – freezing
rain case
2MOM_noLF_n2



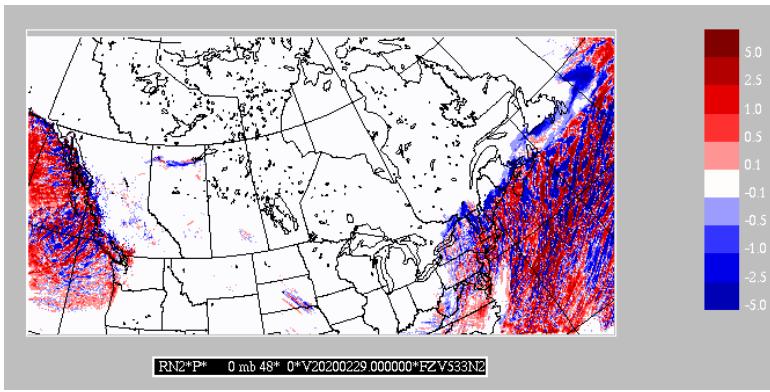
Freezing drizzle



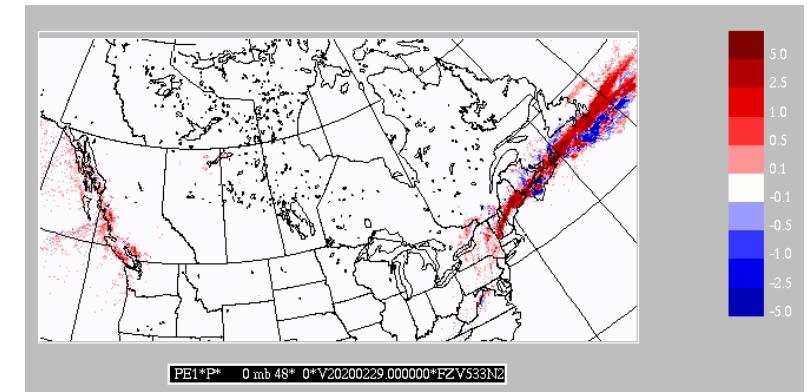
Freezing rain



rain



Ice pellets

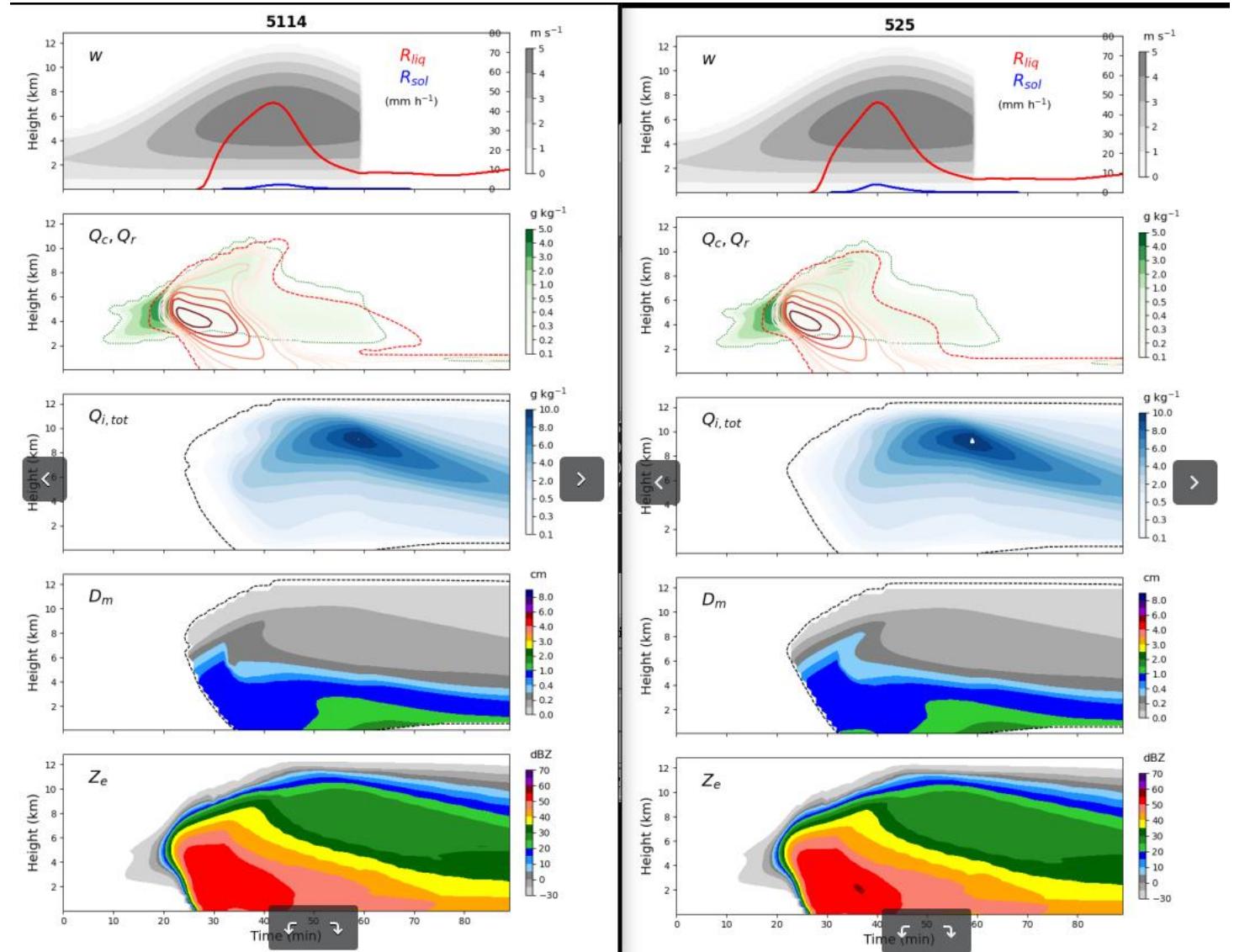


1D

- In 1D:
 - All 2 categories results look horrible with the latest 5.2.0 (to become 5.3.0)
 - The problems is the combination of the new LT1 and the new way to compute the diameter

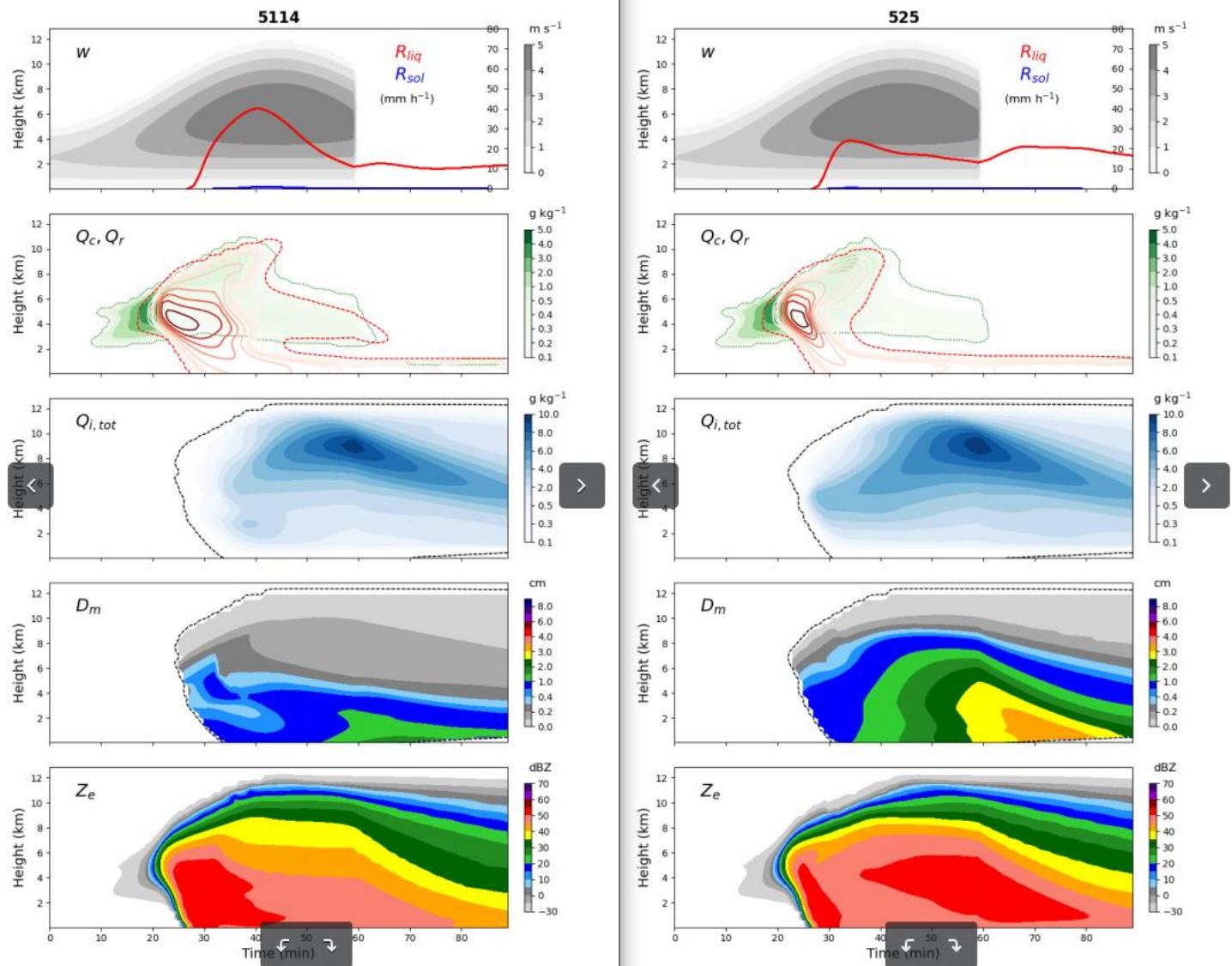
Results 2MOM_noLF_n1

- More collection of rain by ice at the beginning of the stratiform precip, but less sensitive than in the FZ case.



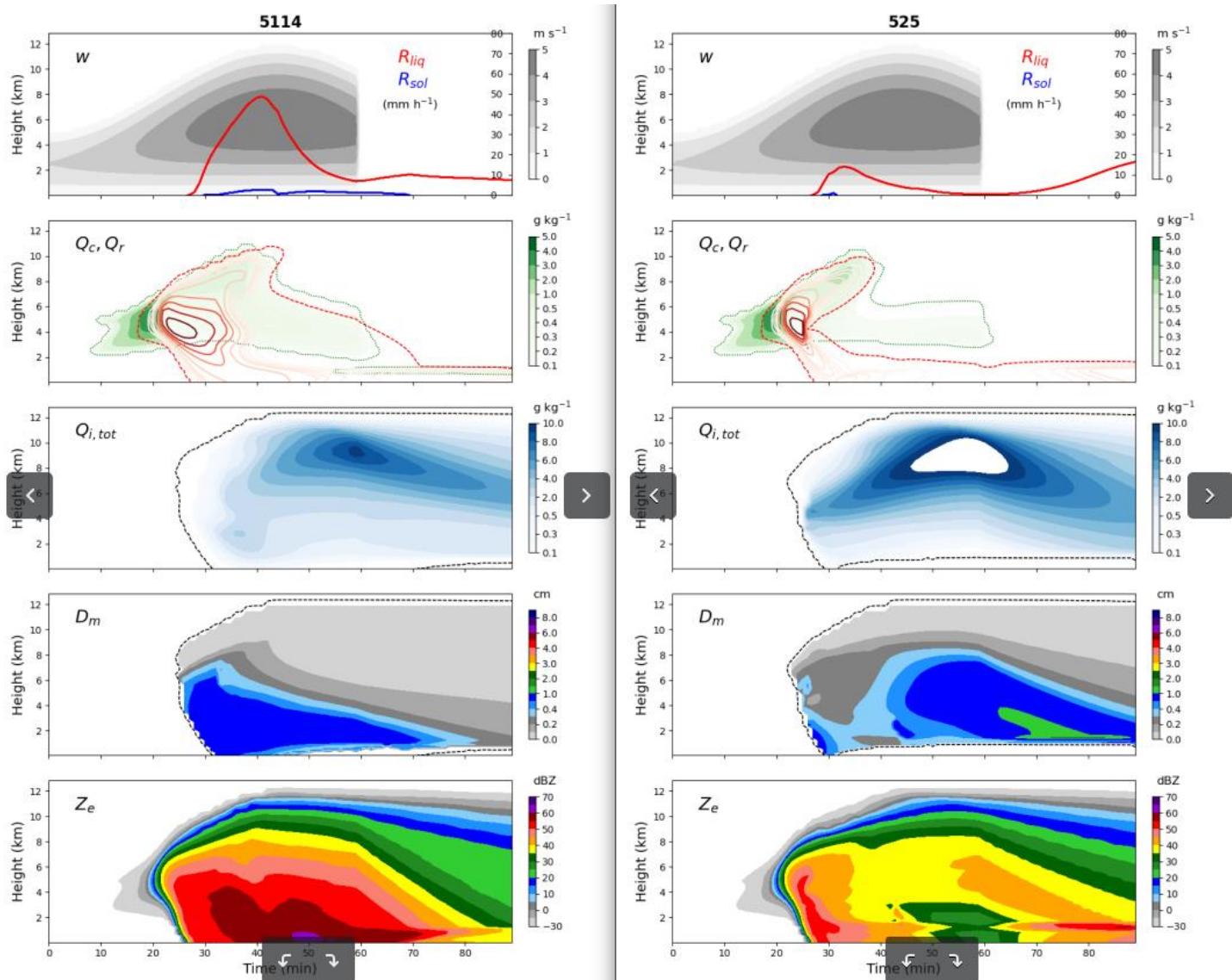
Results 2MOM_noLF_n2

- With 2 cats...



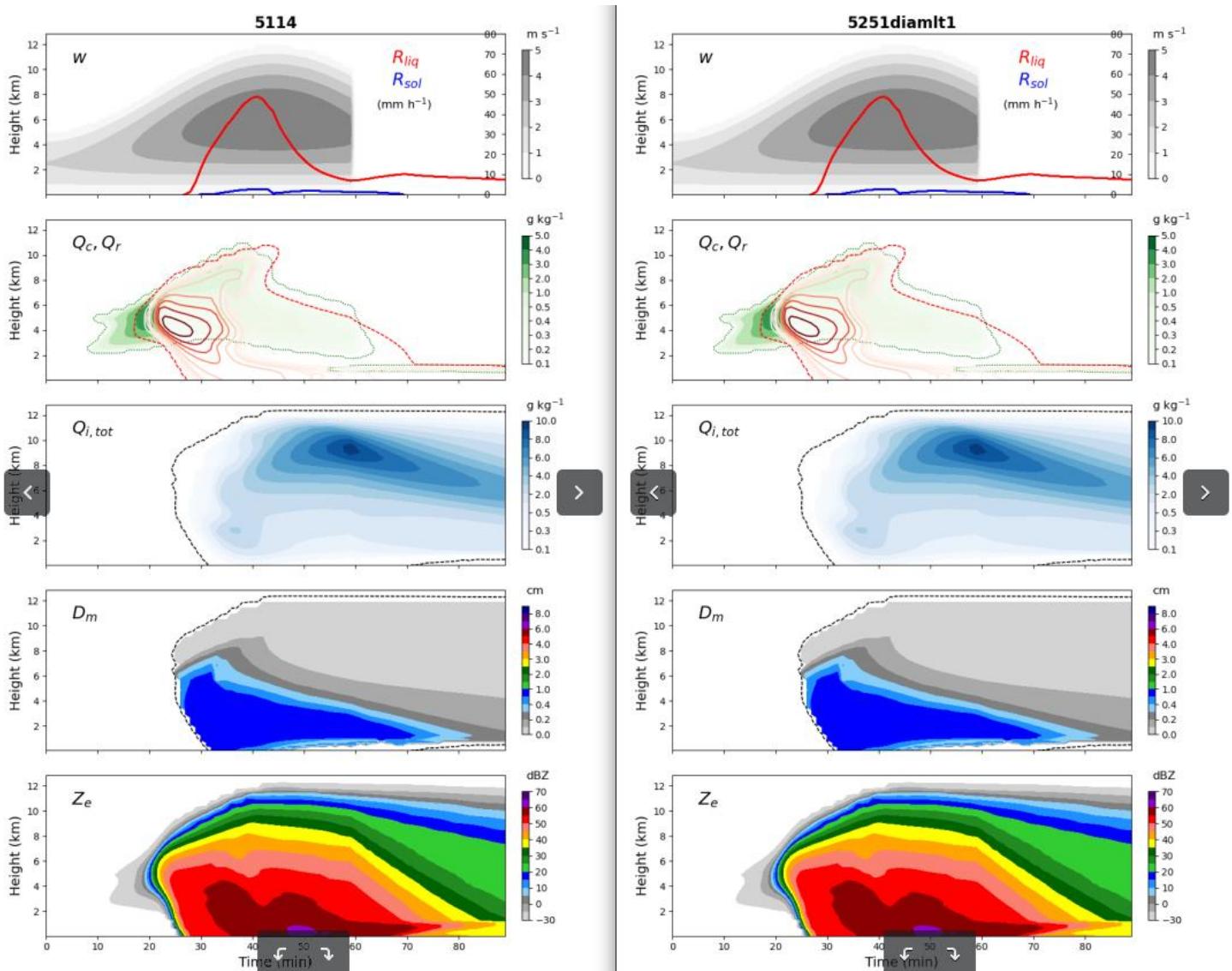
Results 3MOM_LF_n2

- With 2 cats...



problems

- It looks like with $nCat > 1$, it is the combination of the new LT1 and the way to compute `diam_ice` that is causing the differences.
- `3MOM_LF_n2`
- Right \rightarrow old LT1 + old `diam_ice`



Diam_ice

Three ways to compute the diameter in P3:

(1) $((qitot(i,k,iice)*6.)/(nitot(i,k,iice)*500*pi))^{**thrd}$

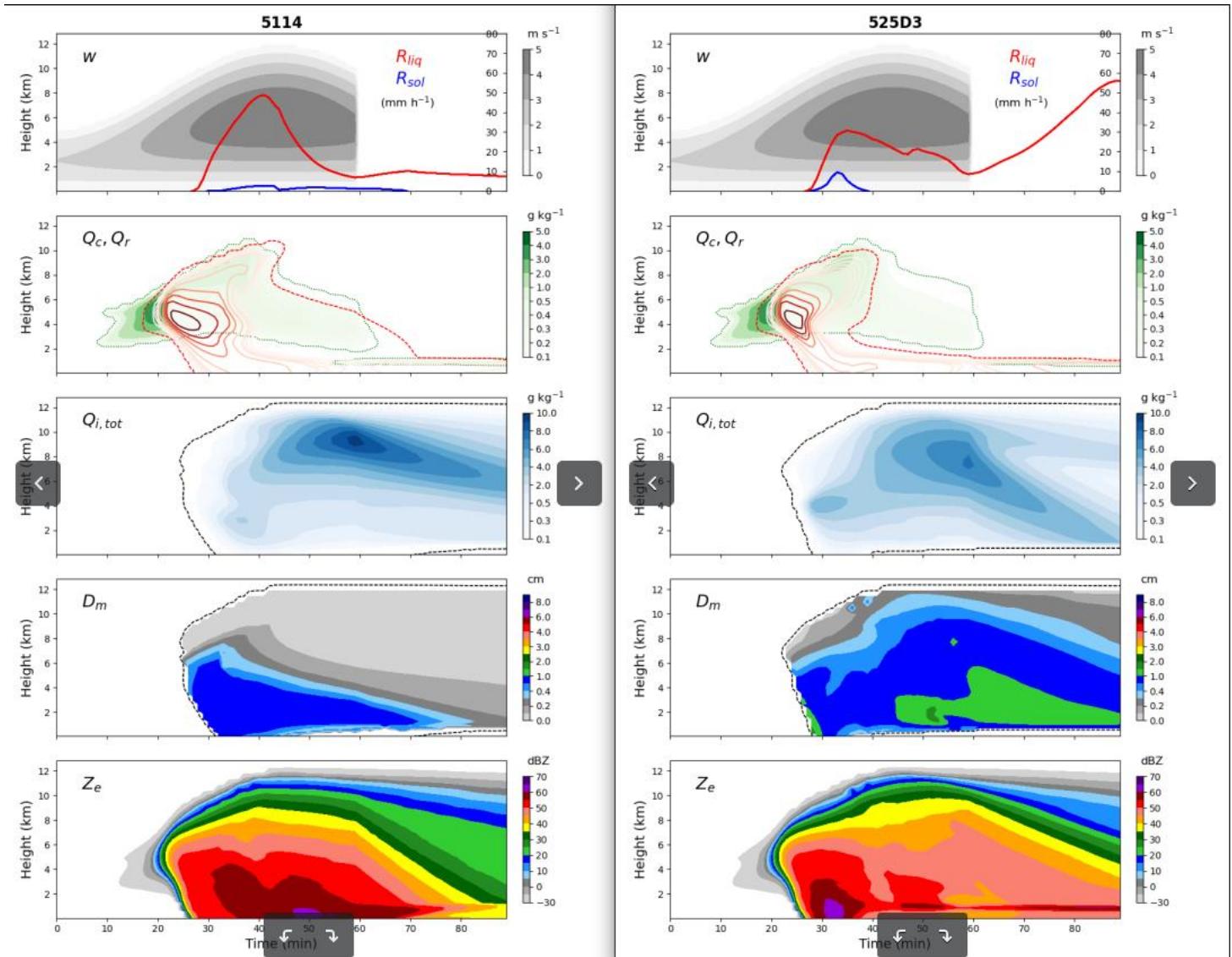
(2) f1pr15 → mass-weighted diameter computed in LT1

(3) $((qitot(i,k,iice)*6.)/(nitot(i,k,iice)*f1pr16*pi))^{**thrd}$, where f1pr16 is the mass-weighted density computed in LT1

	(1)	(2)	(2)-(1)/(1)	(3)	(3)-(1)/(1)
36	2.2303096716133979E-003	1.1253432352459358E-002	404.56815462395701	7.4179036204907629E-003	232.59523172513877
35	2.1475859481233199E-003	1.1184595817182074E-002	420.79851923764897	7.0220622535876335E-003	226.97467869557920
34	2.0472393491190711E-003	1.1432368675019896E-002	458.42853352438999	6.6089940434263640E-003	222.82468809864469
33	1.8968866773955654E-003	1.0300082702799767E-002	442.99936973260998	5.8995358705609168E-003	211.01150853465890
32	1.7563316516205497E-003	9.0515955709671476E-003	415.36938155247219	5.2372623869967085E-003	198.19324739517953
31	1.6440542477151156E-003	8.2742192826332807E-003	403.28140291798030	4.7184887656927998E-003	187.00322828461969
30	1.5252542662148041E-003	7.3877326850739404E-003	384.36072913980058	4.2098012749587034E-003	176.00652351598342
29	1.4055802670235515E-003	6.5242643042487418E-003	364.16874634022037	3.7135593939101666E-003	164.20116168633882
28	1.2895027737289929E-003	5.7864575032749981E-003	348.73556080392763	3.2440143986653962E-003	151.57095159123492
27	1.1754550091412459E-003	4.9982375510234048E-003	325.21725733041677	2.8271018504732793E-003	140.51127678112323
26	1.0690067413582196E-003	4.3945462302191086E-003	311.08685850153262	2.4418593105119566E-003	128.42319099030829
25	9.6766402924743685E-004	3.7931784582239570E-003	291.99333069908096	2.1072101576536163E-003	117.76258018936770
36	2.2273574353121194E-003	1.1236291236930391E-002	404.46735933767411	7.4020286948773724E-003	232.32334323745965
35	2.1445758924924425E-003	1.116303425848264E-002	420.67653399156234	7.0066387693367886E-003	226.71442376392747
34	2.0441348481400924E-003	1.1413198494877545E-002	458.33882511528685	6.5940704663333674E-003	222.58490541038174
33	1.8936256631896585E-003	1.0271720766947205E-002	442.43671104696193	5.8844915785422353E-003	210.75263146942609
32	1.7532905931783125E-003	9.0313231426313416E-003	415.10703232940017	5.2226621846336429E-003	197.87772802488823
31	1.6408931083379840E-003	8.2513262408639154E-003	402.85580449670238	4.7043213164207065E-003	186.69273412852502
30	1.5222213496097535E-003	7.3640872892973951E-003	383.77243501316678	4.1971549562180811E-003	175.72566613220155
29	1.4029203253085700E-003	6.5081320220698735E-003	363.89890463939361	3.7021143084167781E-003	163.88628360648383
28	1.2872338151119511E-003	5.7717025289754391E-003	348.38027569012178	3.2351378156782111E-003	151.32480033527168
27	1.1736376997738965E-003	4.9858924537212685E-003	324.82381527807172	2.8209342038246783E-003	140.35817905032673
26	1.0676550431316285E-003	4.3878634237829615E-003	310.98137942687481	2.4373652468565711E-003	128.29145635909993
25	9.6656578267146135E-004	3.7871903269648690E-003	291.81920101677616	2.1039301419169781E-003	117.67066242527130

problems

- 3MOM_LF_n2
- When taking (3) for diam_ice + new LT1



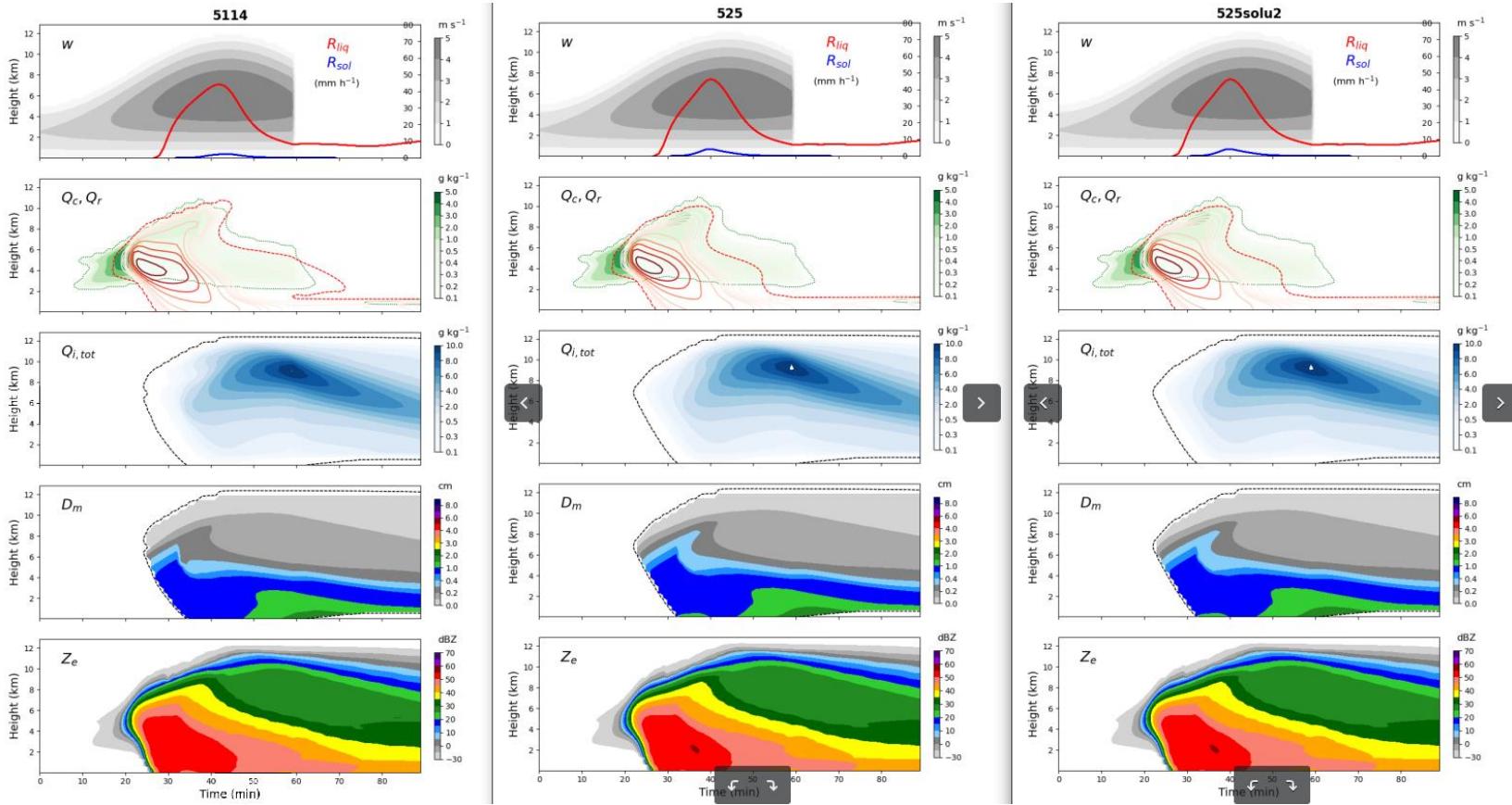
solution

- 2MOM_noLF_n1
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

```

If (nCat>1) then
    eri = 0.25
else
    eri = 1.
endif

```



solution

- 2MOM_noLF_n2
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

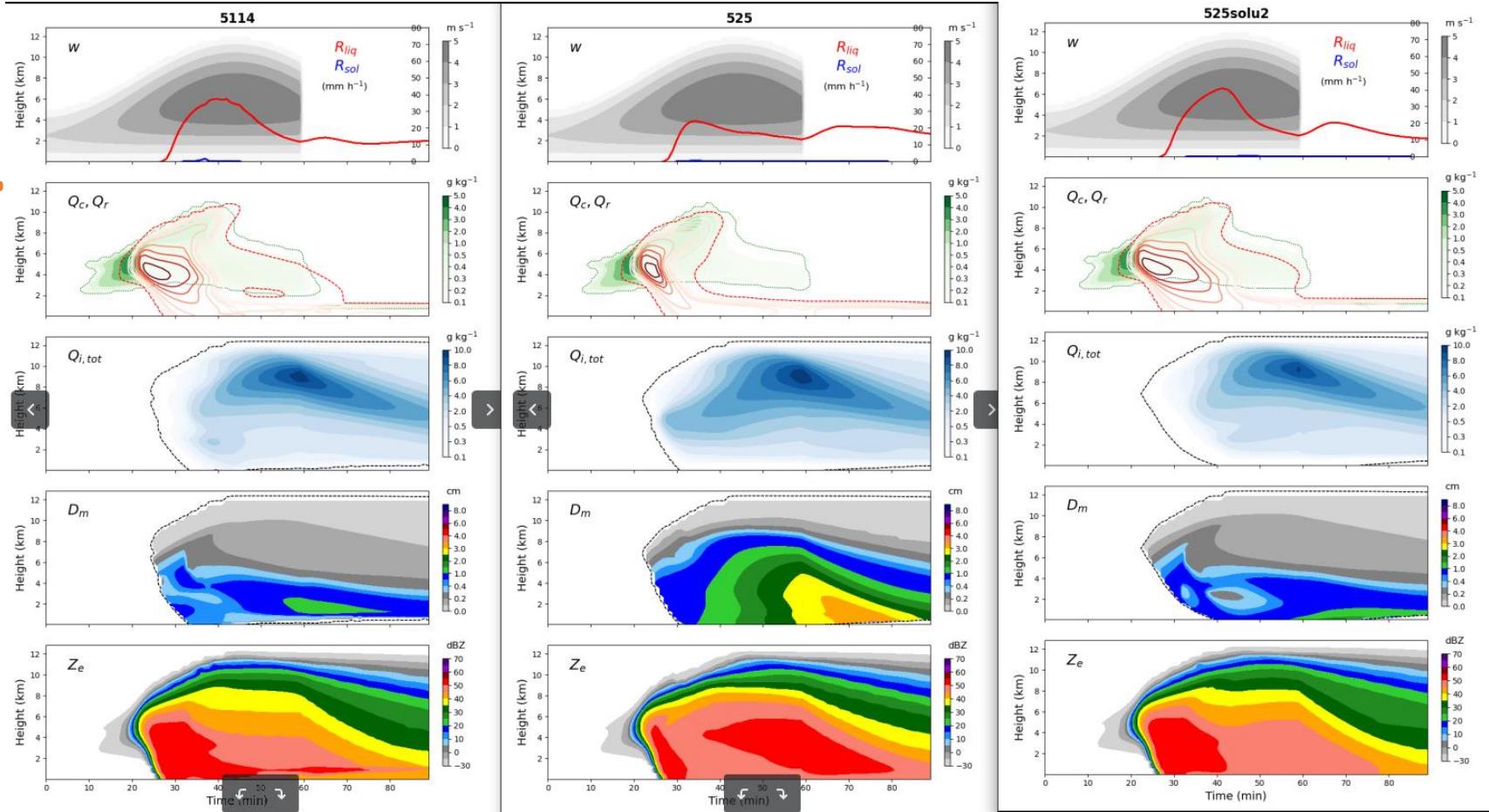
If (nCat>1) then

 eri = 0.25

else

 eri = 1.

endif



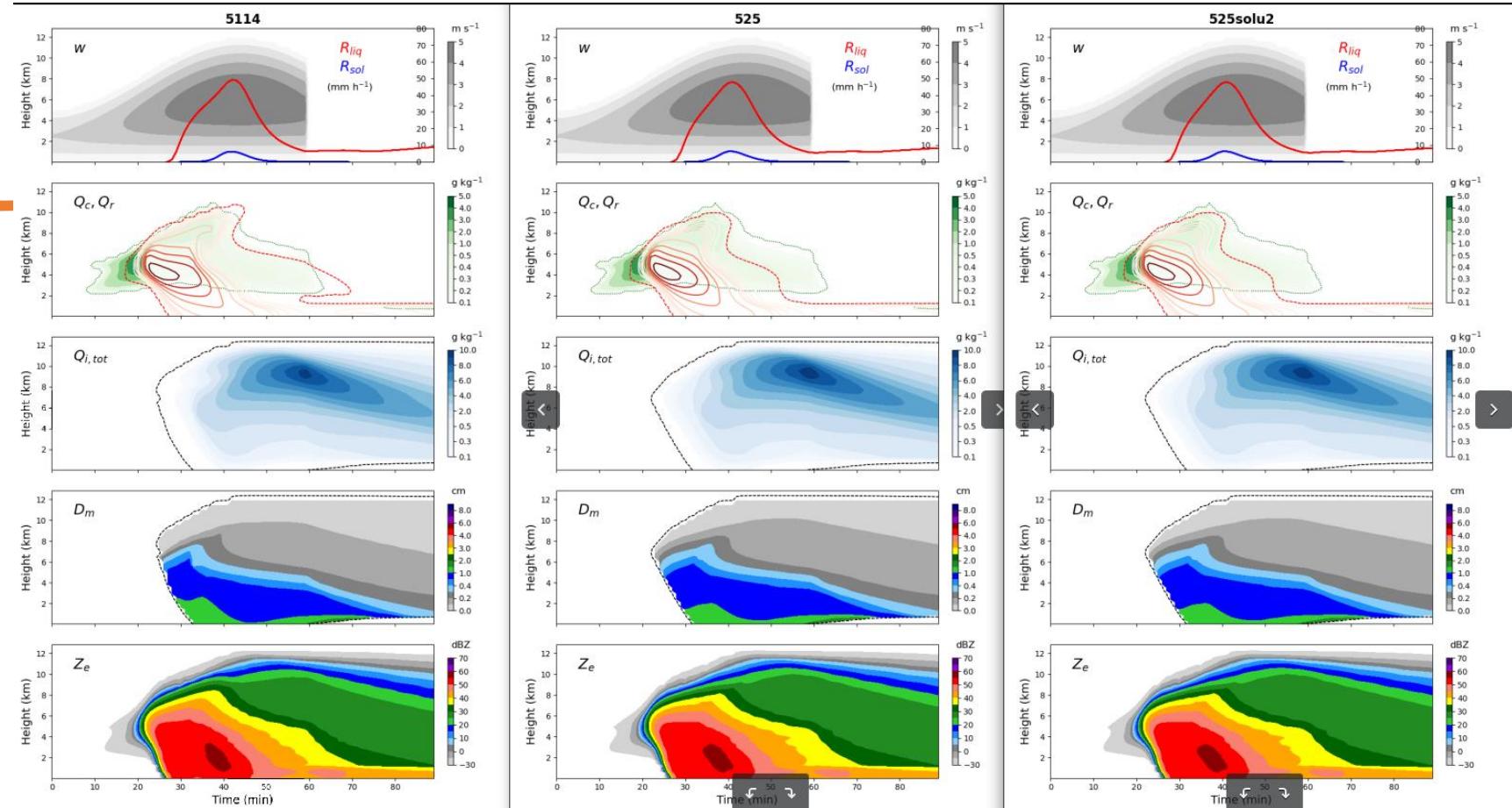
solution

- 3MOM_noLF_n1
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

```

If (nCat>1) then
    eri = 0.25
else
    eri = 1.
endif

```



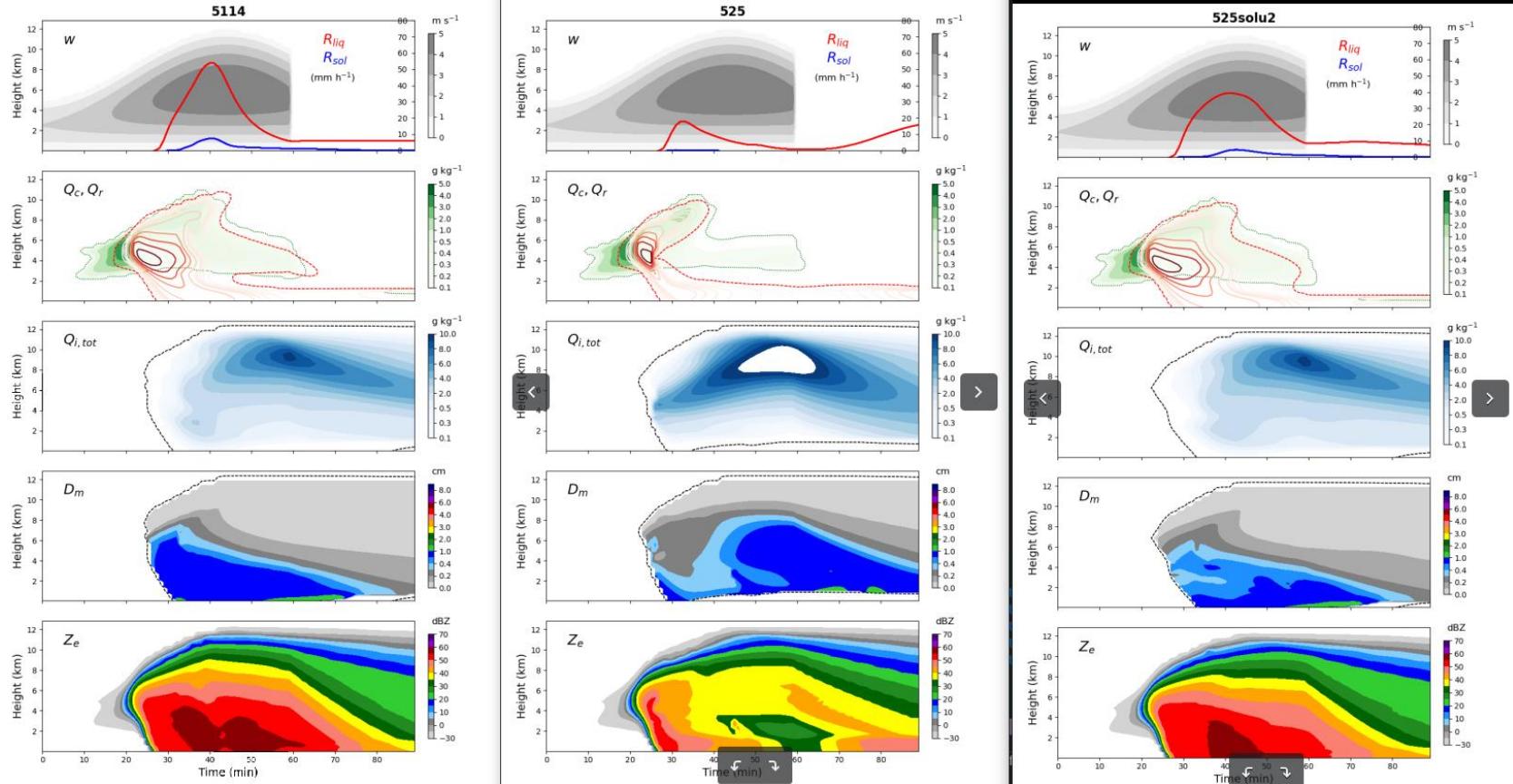
solution

- 3MOM_noLF_n2
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

```

If (nCat>1) then
    eri = 0.25
else
    eri = 1.
endif

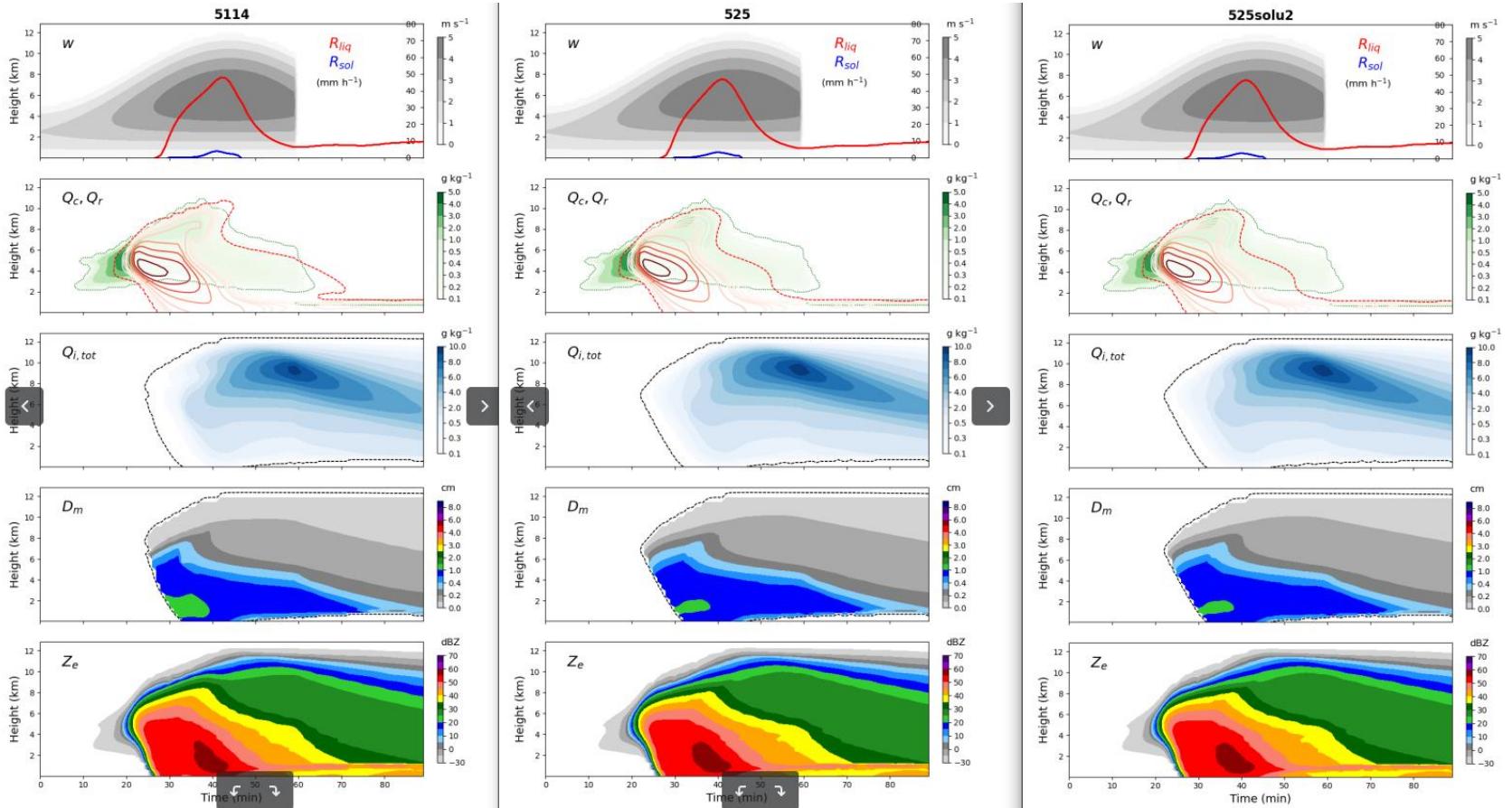
```



solution

- 3MOM_LF_n1
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

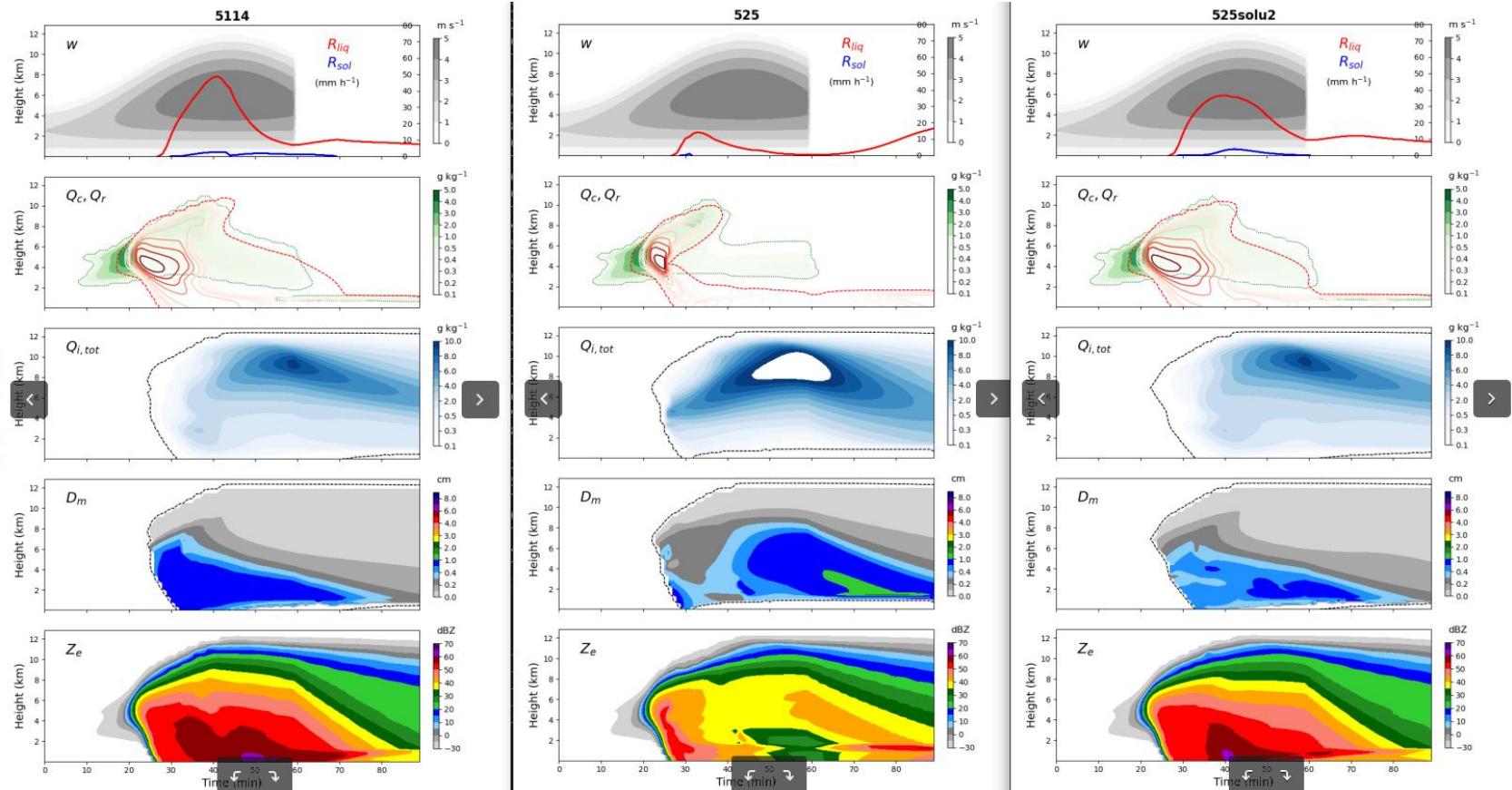
```
If (nCat>1) then  
    eri = 0.25  
else  
    eri = 1.  
endif
```



solution

- 3MOM_LF_n2
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

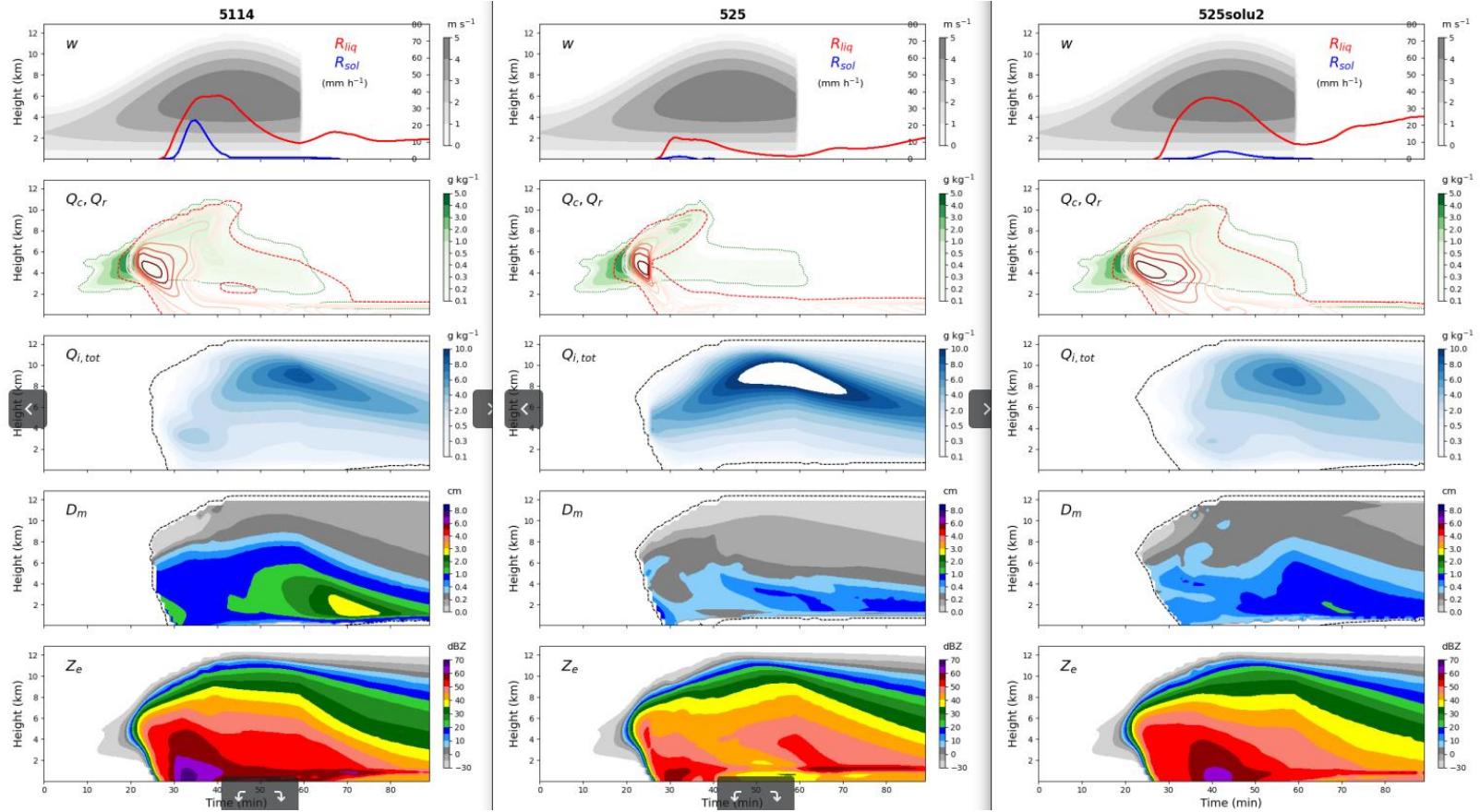
```
If (nCat>1) then  
    eri = 0.25  
else  
    eri = 1.  
endif
```



solution

- 3MOM_LF_n3
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

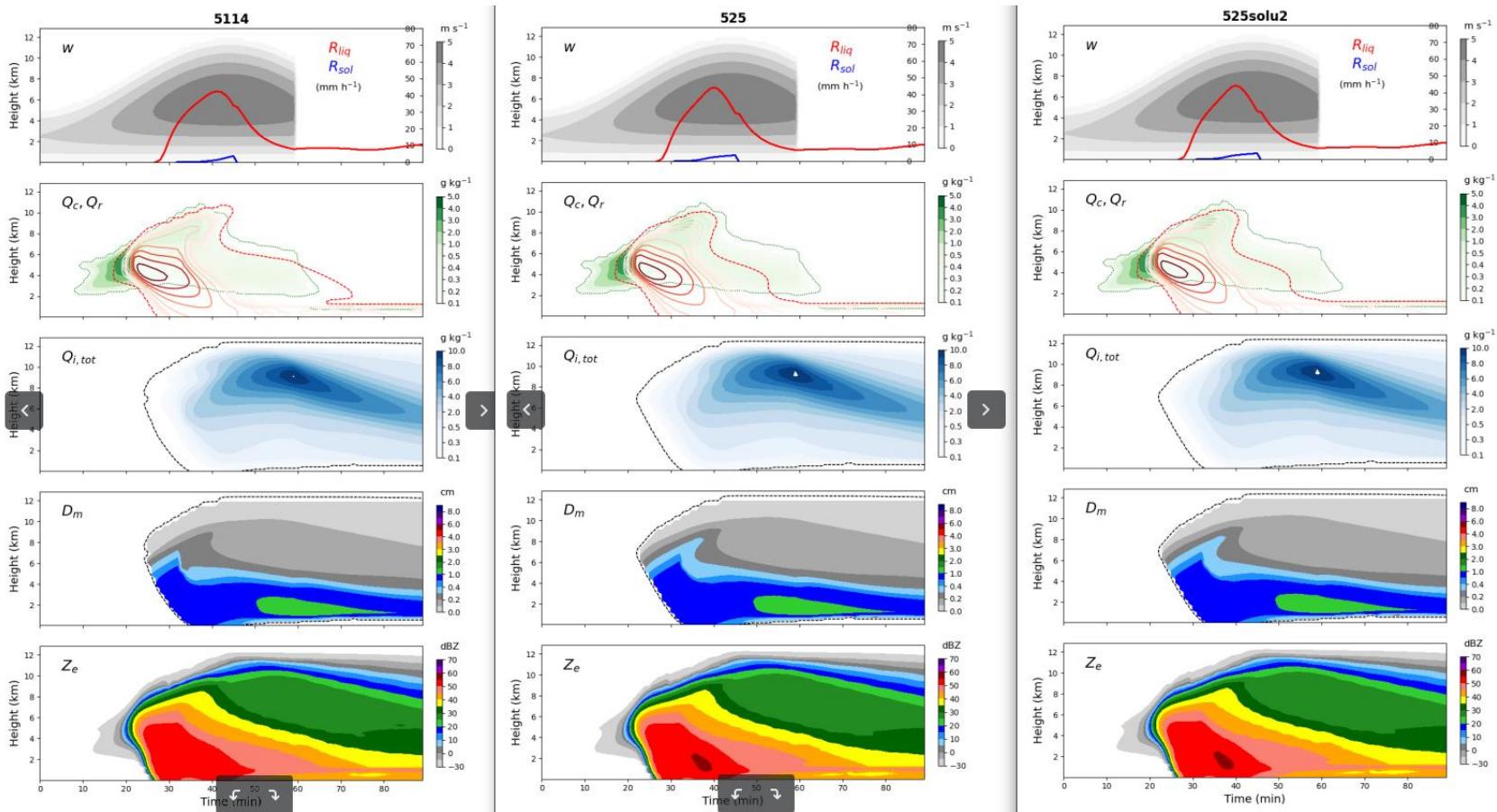
```
If (nCat>1) then  
    eri = 0.25  
else  
    eri = 1.  
endif
```



solution

- 2MOM_LF_n1
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

```
If (nCat>1) then  
    eri = 0.25  
else  
    eri = 1.  
endif
```



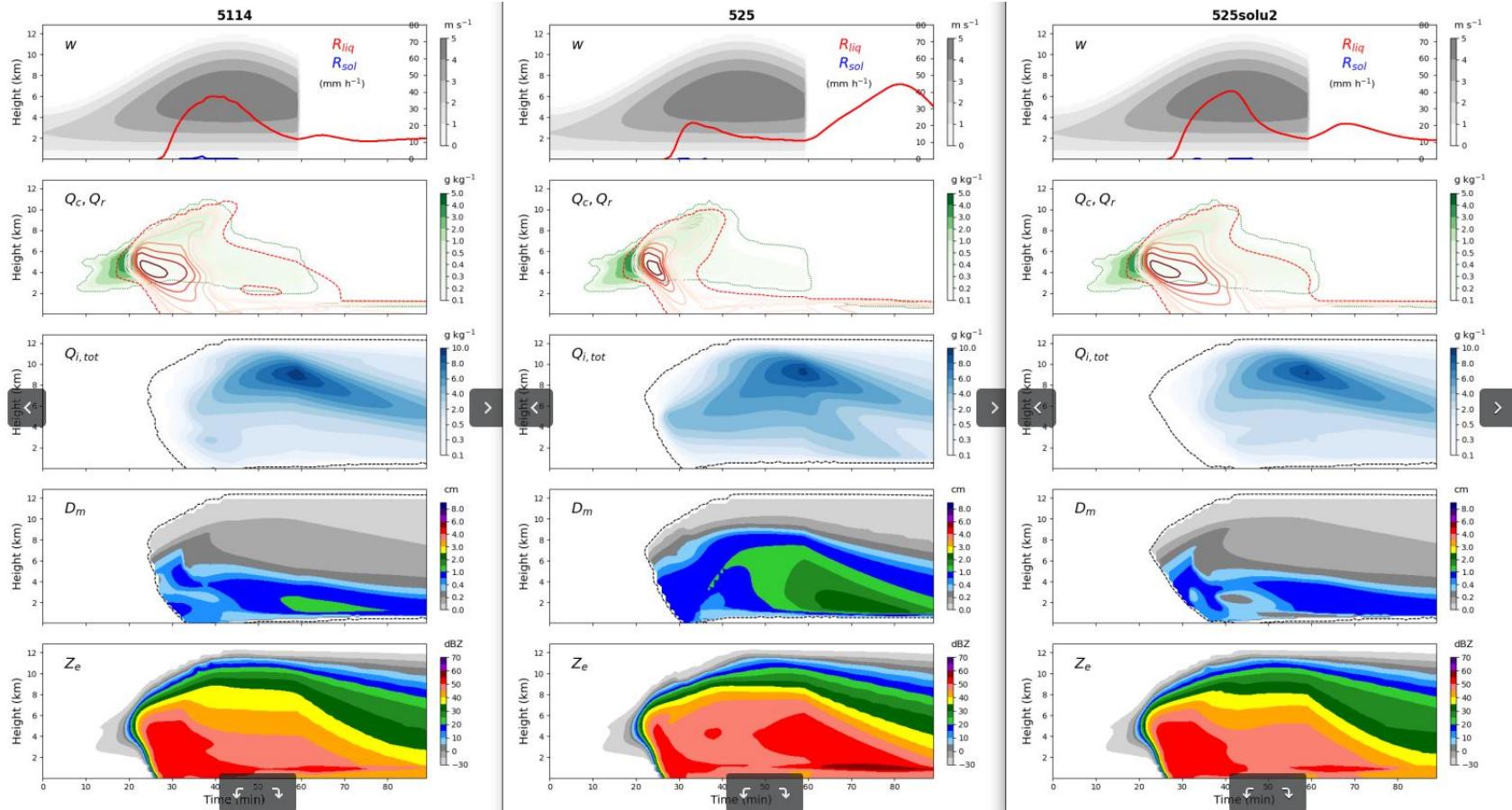
solution

- 2MOM_LF_n2
- When taking (3) for diam_ice + new LT1
- Modification of ERI when nCat>1:

```

If (nCat>1) then
    eri = 0.25
else
    eri = 1.
endif

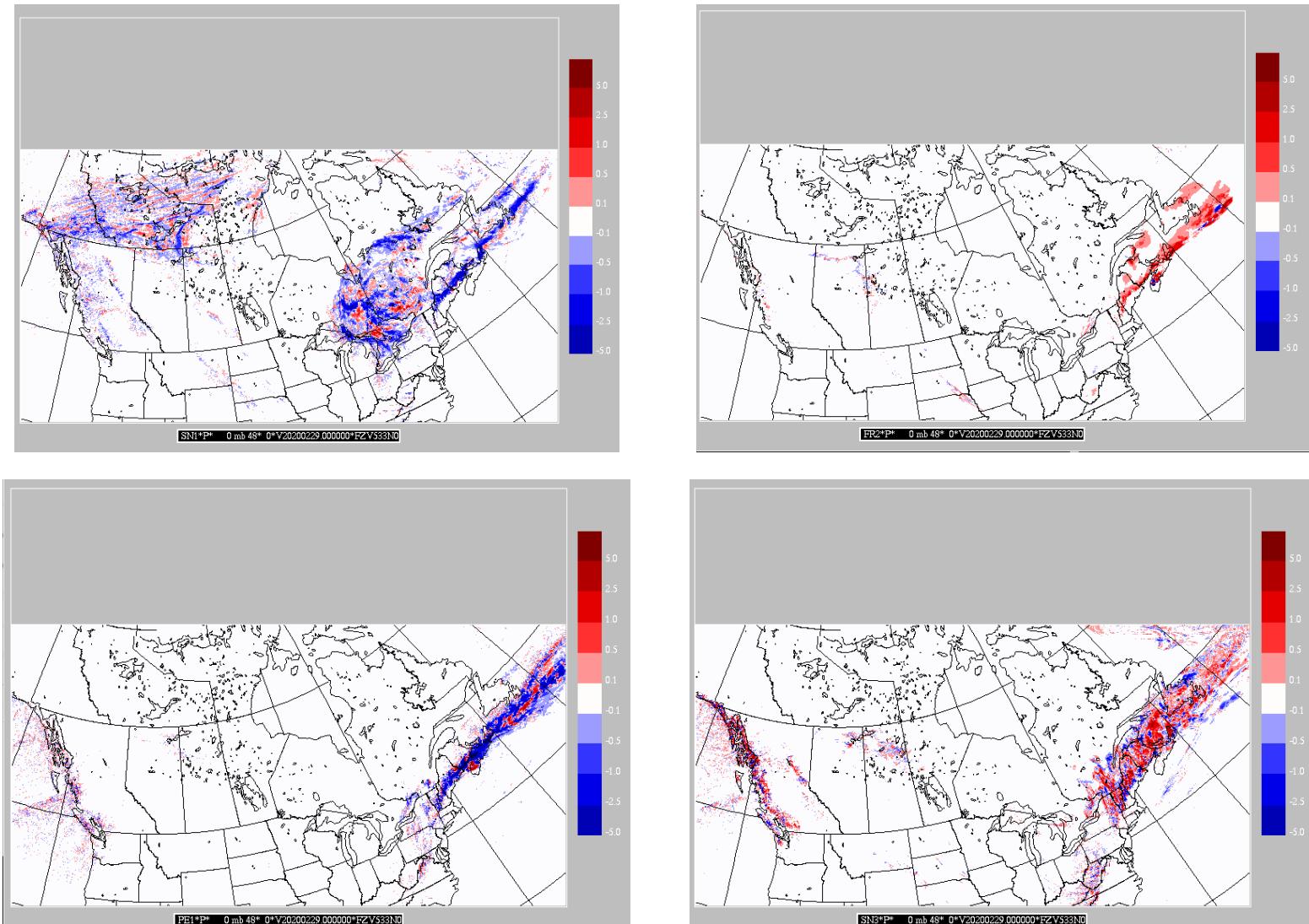
```



Test in GEM

- Diam 3 + LT1 + new ERI (only for nCat>1)
- I am not sure that this goes in the right direction for nCat>1 both for the hail and the freezing rain storm.

Freezing rain case (2mom_LF_n2)



Hail case
3MOM_LF_N
3 (top)
3MOM_noLF
_n3 (bottom)

