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^{222}RN simulations for validation of transport and vertical diffusion in TM5 model

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Simulations of ^{222}RN: TM5 sensitivity

1. Parameterization of vertical diffusion

2. Comparisons between TM5 v25 versus v34 vertical layers

3. First results of simulations based on the use of different ^{222}RN inventories

Simulations of ^{222}RN: TM5 sensitivity

1.Vertical Diffusion "parameterization":

- Simulations for the year 2001
- Global domain 6x4 deg, two zoom regions: eur 3x2, eur1x1
  - a.Runs with bugs in the code,
  - b.Corrected one by Wouter Peters,

```
wheat(i,j)=-1*wheat(i,j)    !WP! bug fix
wqflx(i,j)=-1*wqflx(i,j)    !WP! bug fix
```

  - c. New one discovered by Maarten Krol

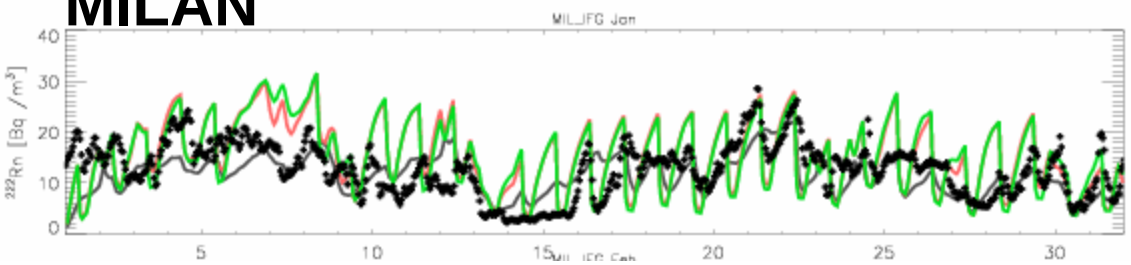
```
!mid-layer heights (note: gph array is for levels 1:lm+1)
 do l=1,lm(region)
  do j=jsr(region), jer(region)
   do i=isr(region), ier(region)
     intfac = (phlb(i,j,l)-pf(i,j,l)) / (phlb(i,j,l)-phlb(i,j,l+1))
     whm(i,j,l) = (gph(i,j,l)-gph(i,j,1))*(1.0-intfac)+(gph(i,j,l+1)-gph(i,j,1))*intfac
! cmk bug corrected: was (gph(i,j,l+1)-gph(i,j,1))
      end do
   end do
  end do
```

2.TM5 v25 versus v34 vertical layers

3. Using different ^{222}RN inventories

Improvements on diffusion subroutine

MILAN



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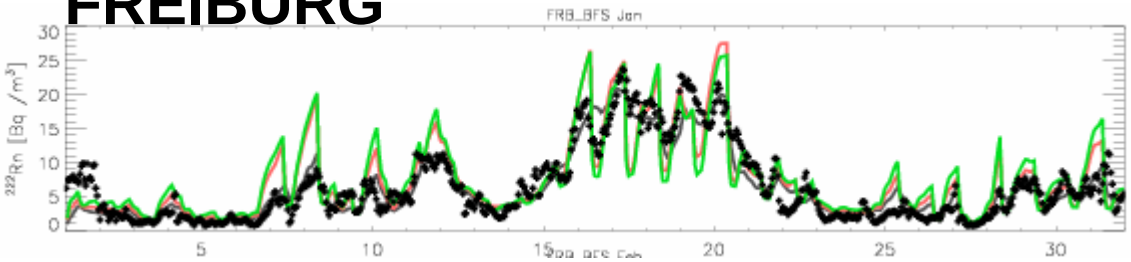
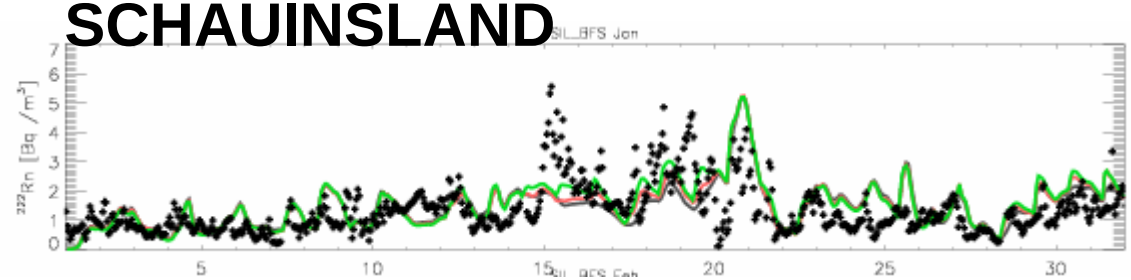


SCHAUINSLAND



January 2001

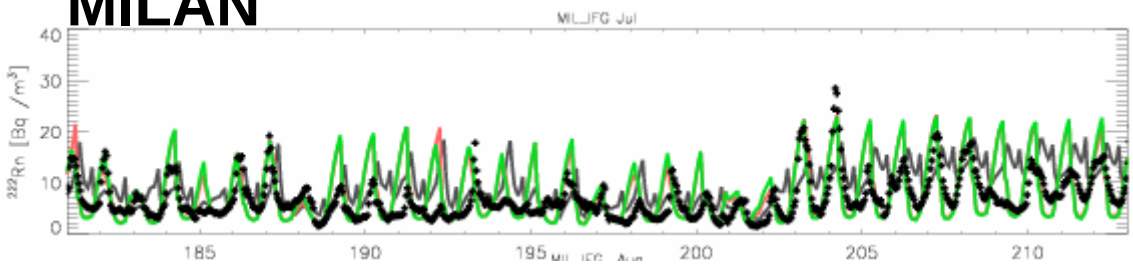
TM5 w bugs

TM5 o-diff

TM5 n-diff

Improvements on diffusion subroutine

MILAN



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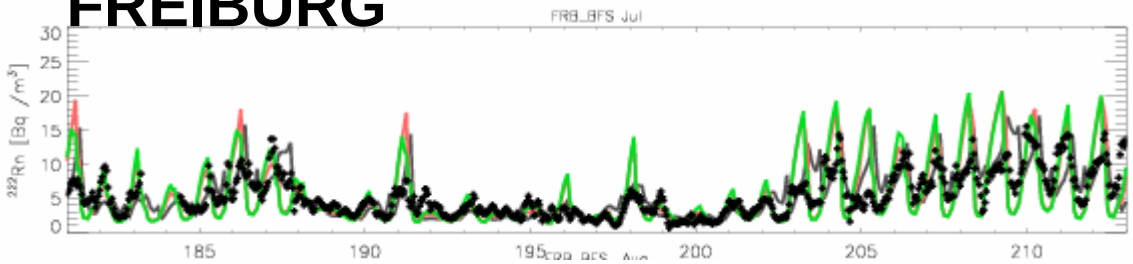

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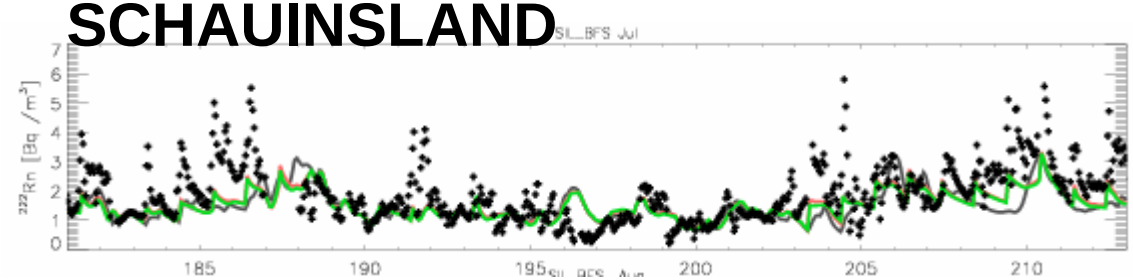

July 2001

TM5 w bugs
TM5 o-diff
TM5 n-diff

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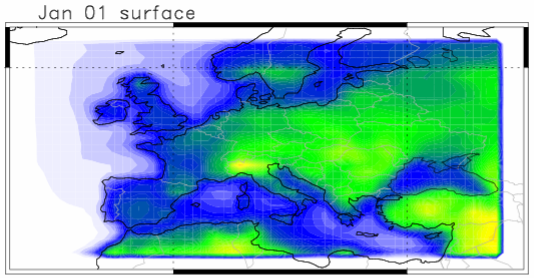
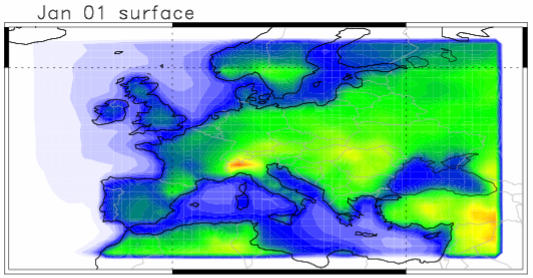
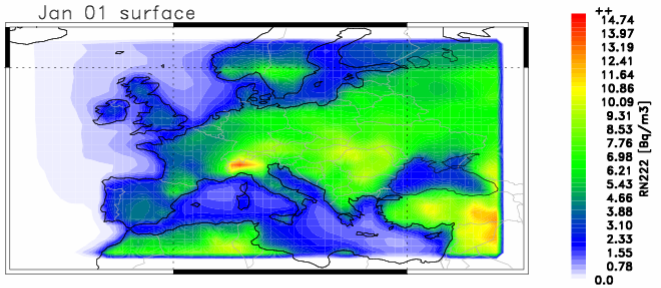
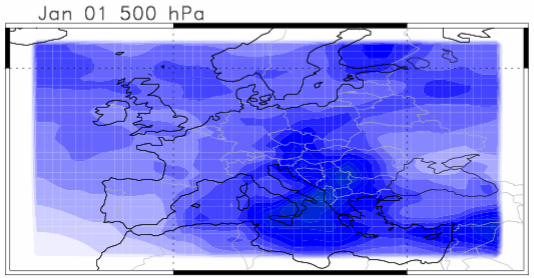
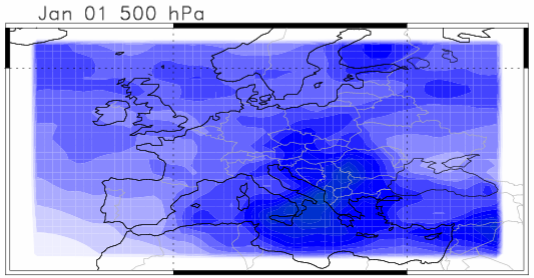
Diffusion Subroutine:
^{222}RN maps for January 2001, Europe

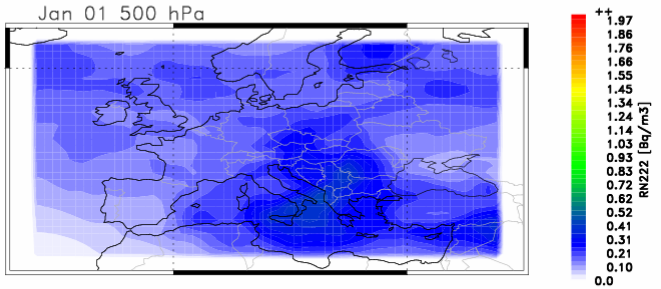


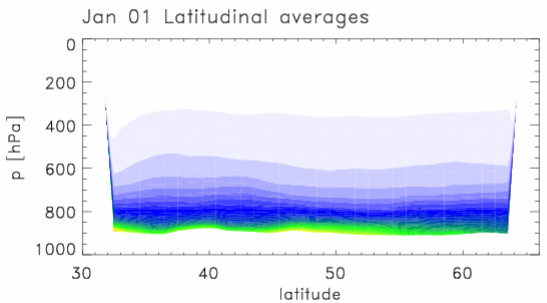


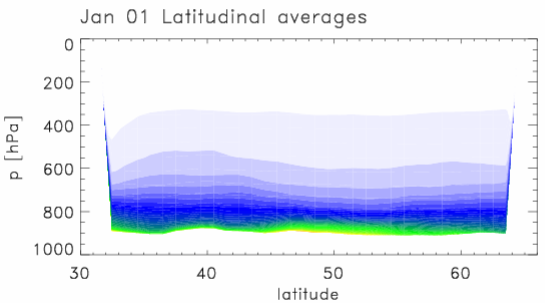


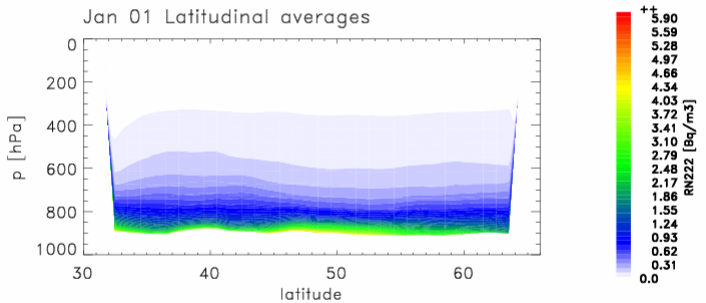












BUG

o-diff

n-diff

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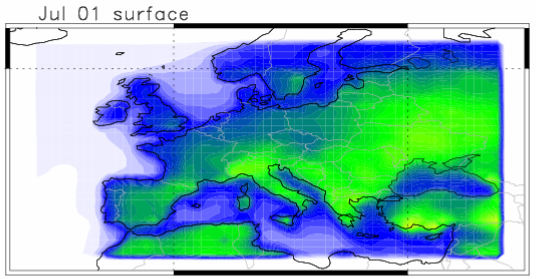
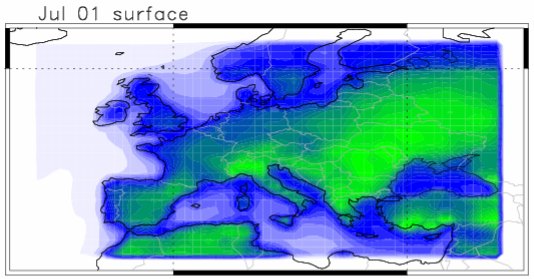
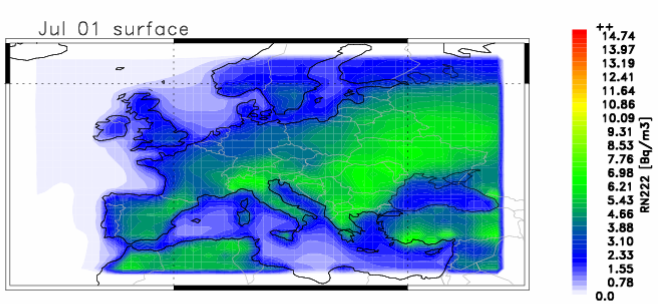
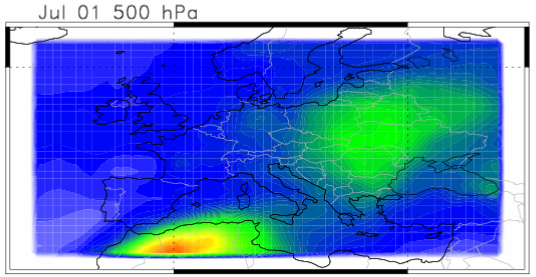
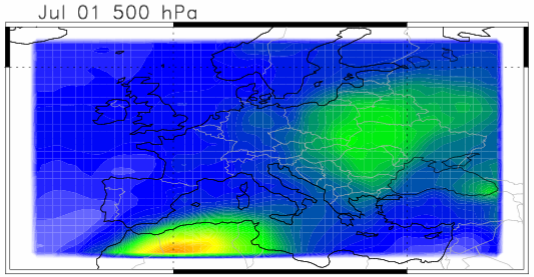
Diffusion Subroutine:
^{222}RN maps for July 2001, Europe

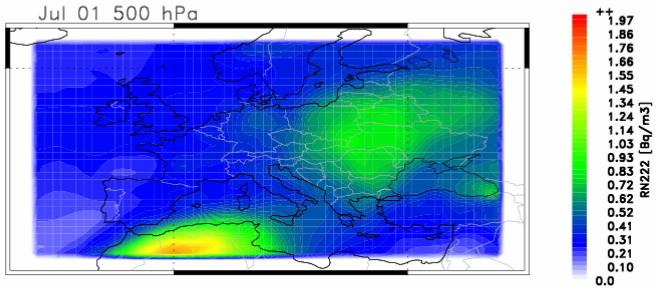


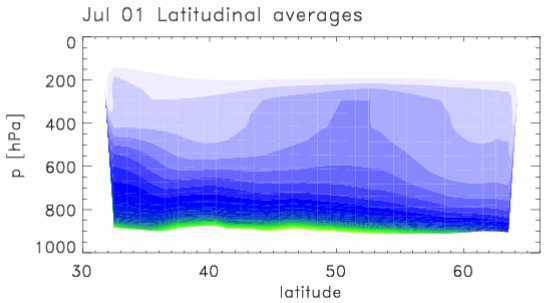


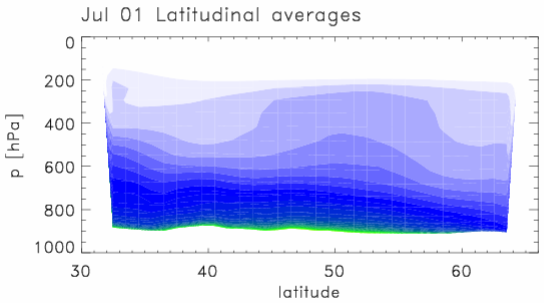


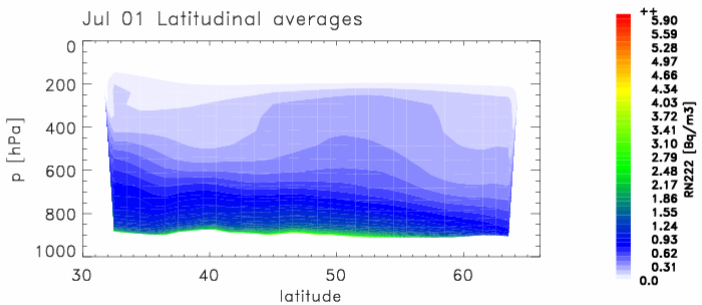












BUG

o-diff

n-diff

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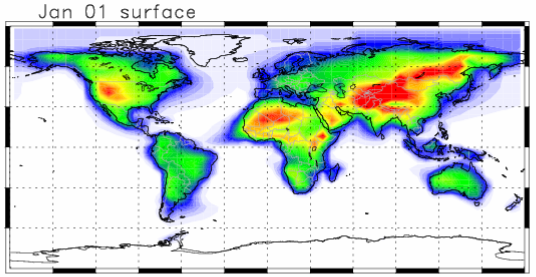
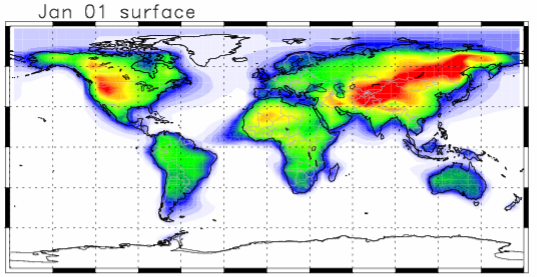
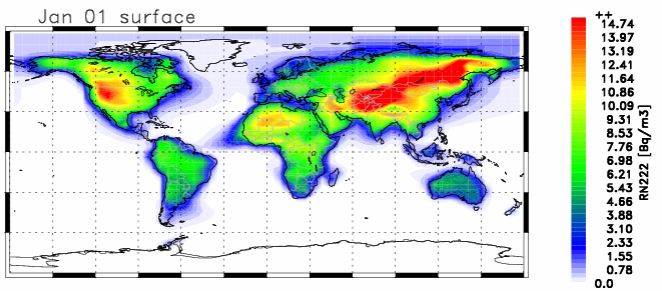
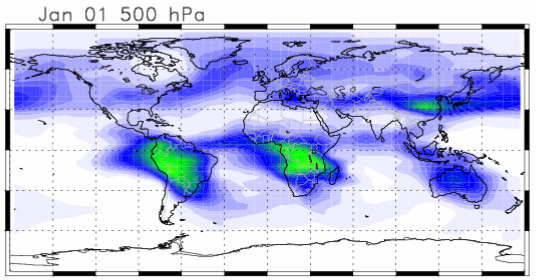
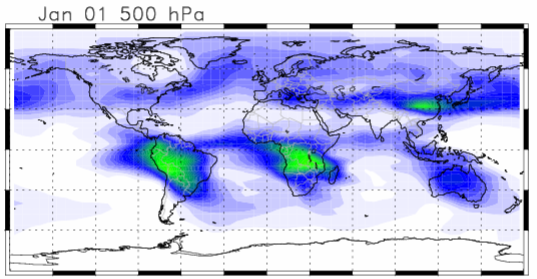
Diffusion Subroutine: ^{222}RN maps for January 2001, Globe

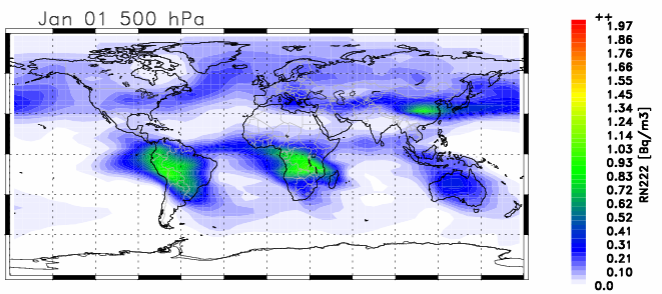


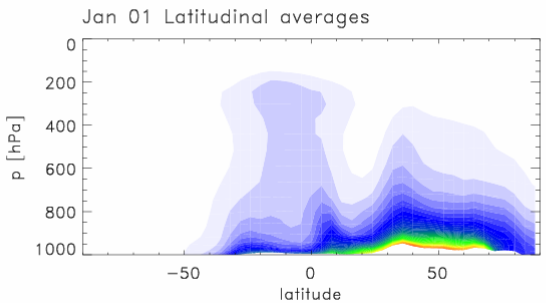


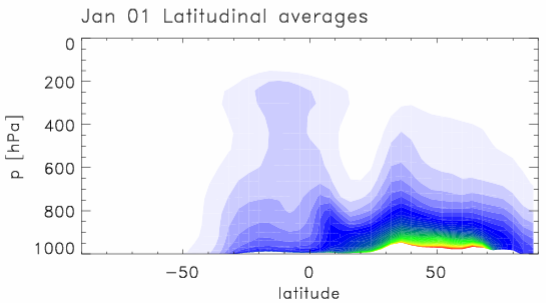


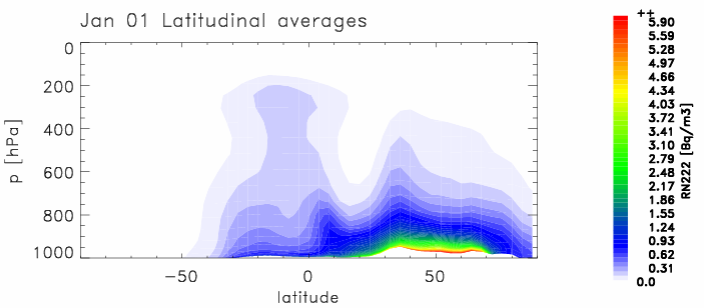












BUG

o-diff

n-diff

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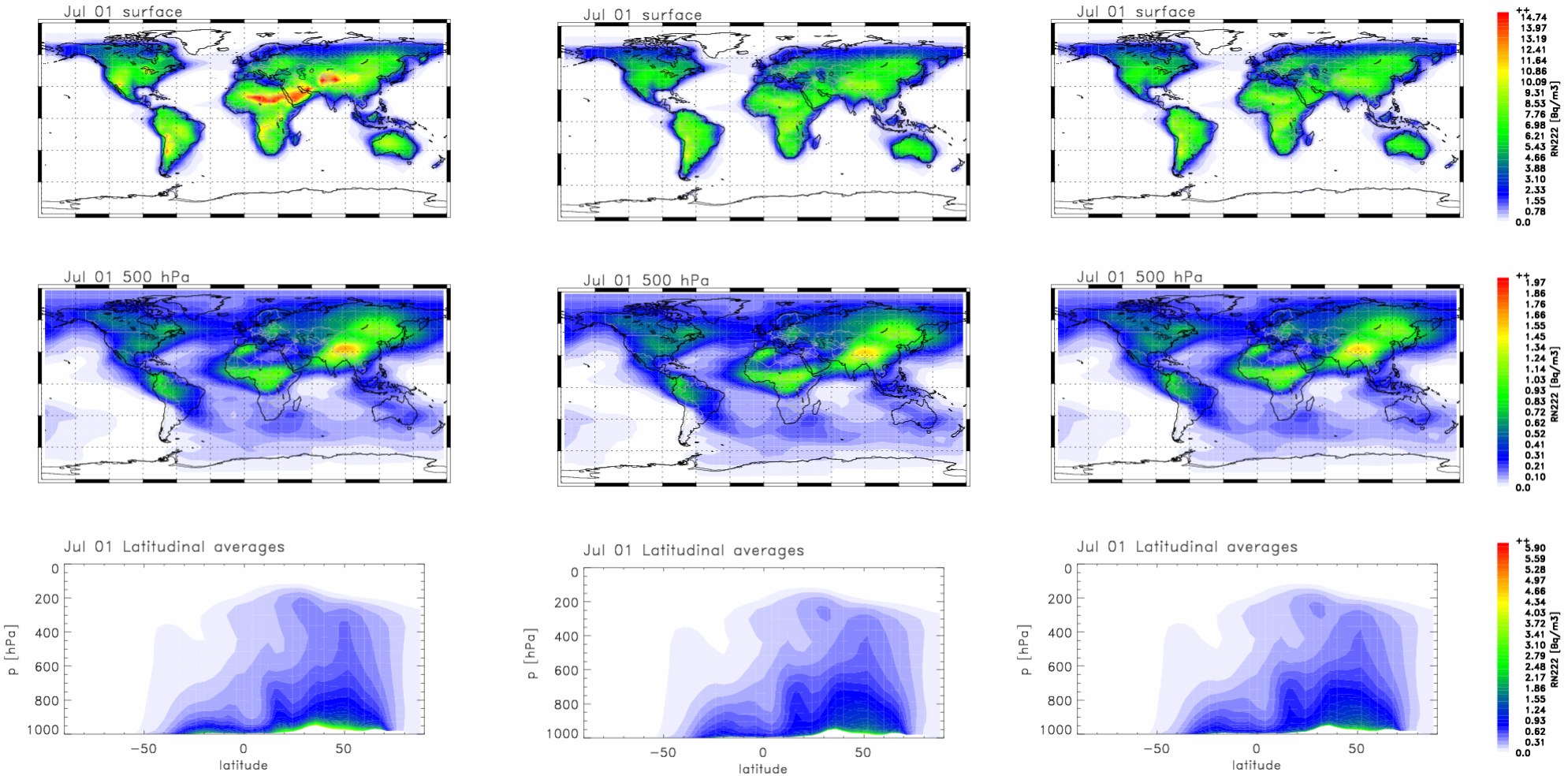
Diffusion Subroutine:
^{222}RN maps for July 2001, Globe



BUG

o-diff

n-diff

Simulations of ^{222}RN: TM5 sensitivity

1.Vertical Diffusion “parameterization”

2.TM5 v25 versus v34 vertical layers:
- Simulations for October 2005-January 2006
- Global domain 6x4 deg, two zoom regions: eur 3x2, eur1x1

3. Using different ^{222}RN inventories

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TM5: 25v(BLUE) versus 34v(BLACK) layers

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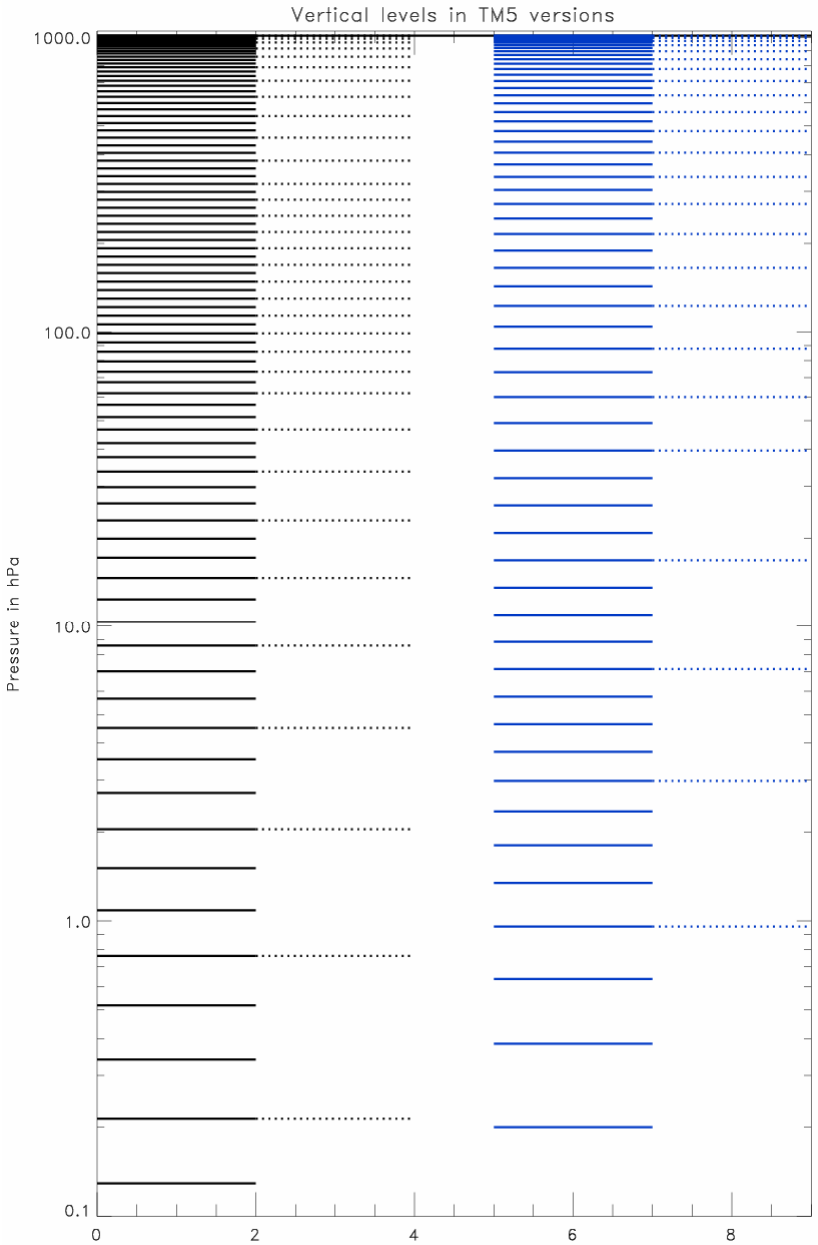
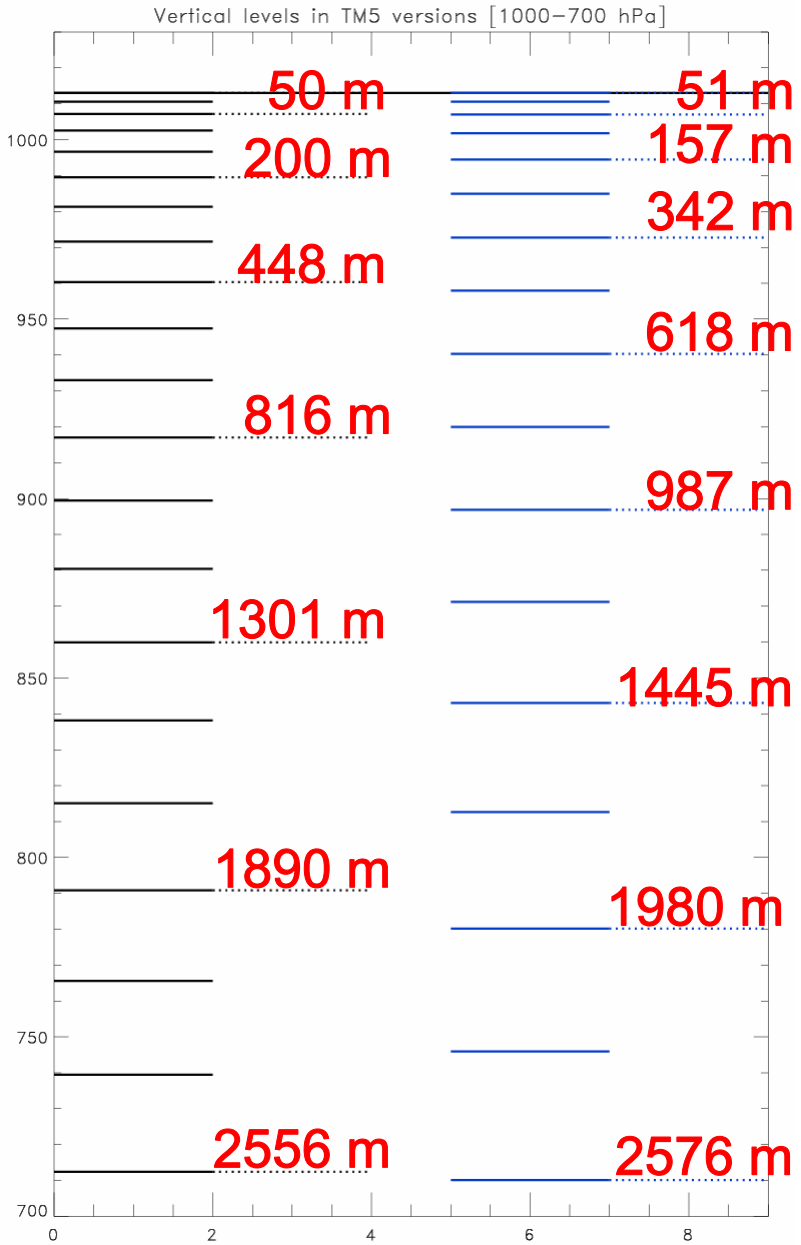
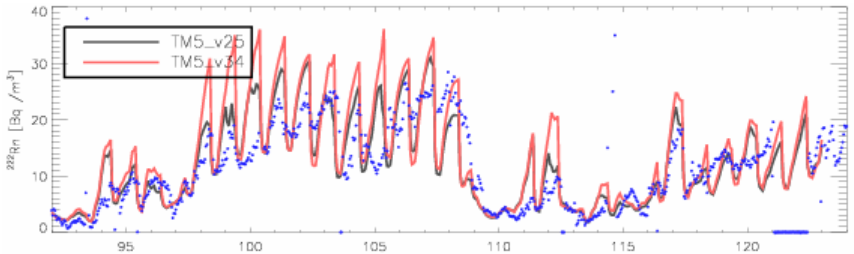
Solid line : grid heights for ECMWF levels
Dotted line: grid heights for TM5 levels



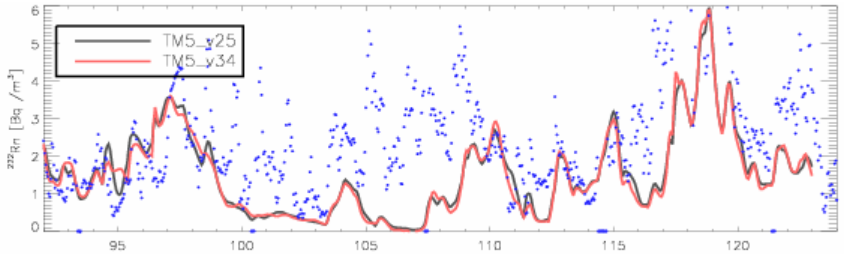


TM5: 25v versus 34v layers: January 2006

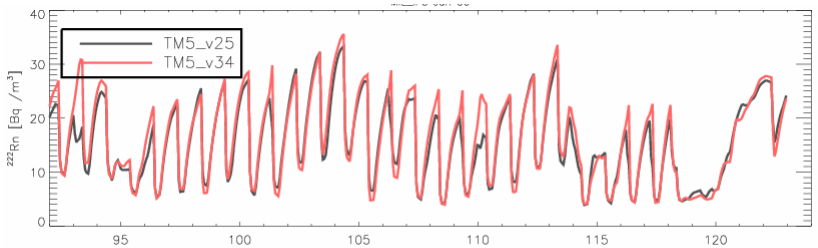
Freiburg (276m asl)
V25: 1st level
V34: 1st level



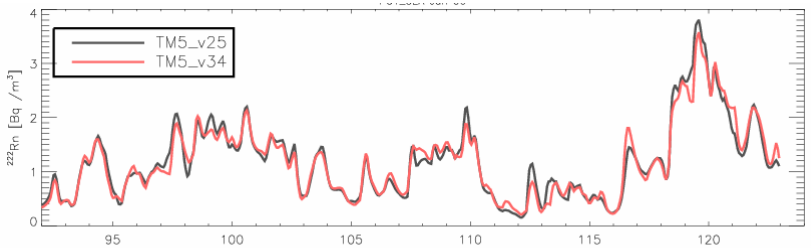
Schauinsland (1205m asl)
V25:5th level
V34:4th level



Milan (103m asl)
V25:1st level
V34:1st level



Puy de Dome (1465m asl)
V25:5th level
V34:5th level



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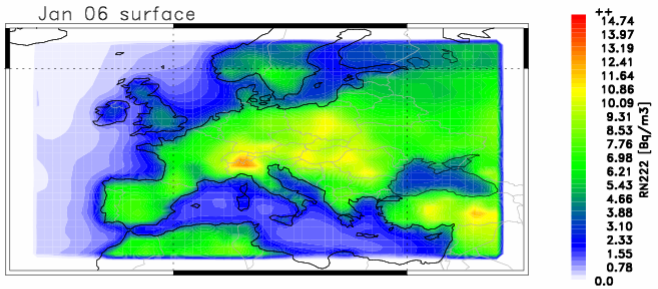
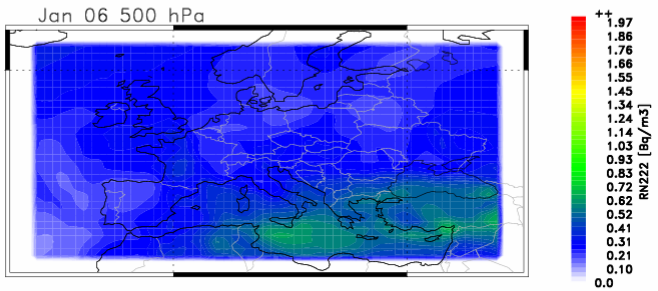
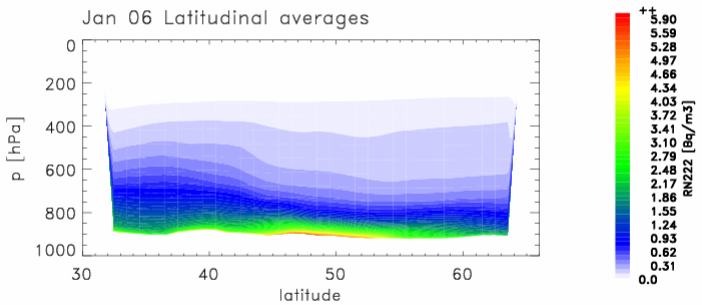
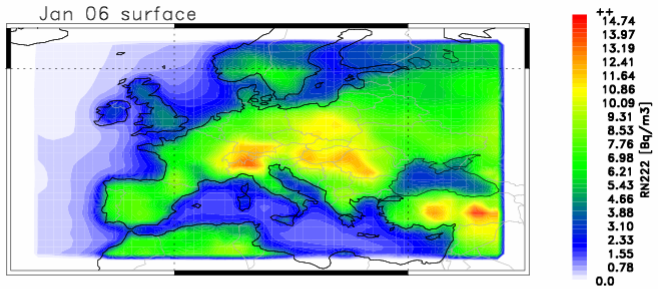
TM5: 25v versus 34v layers: Europe maps for January 2006

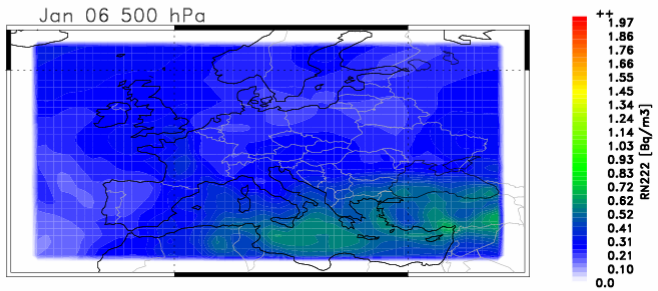


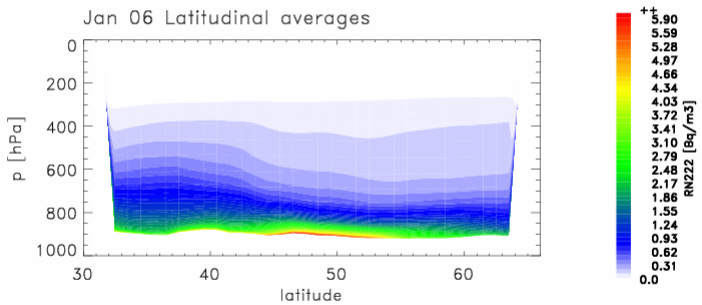




TM5 v25

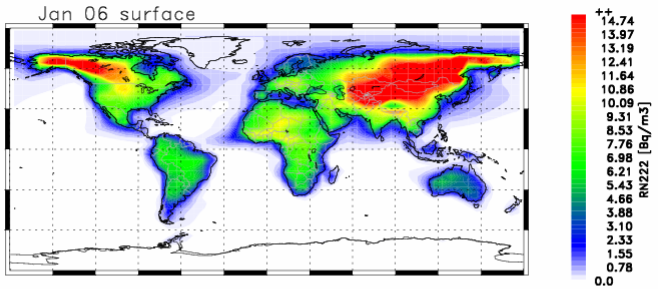


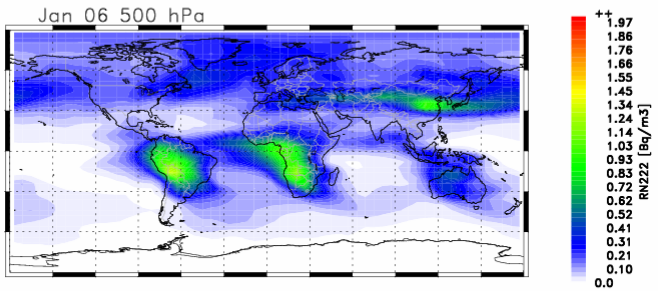


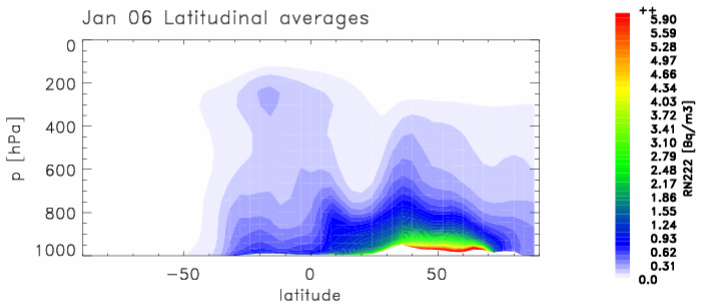


TM5 v34

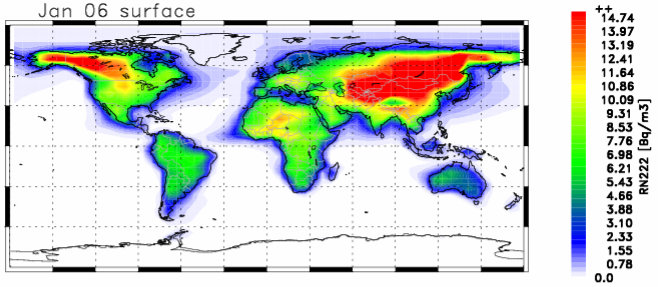
TM5: 25v versus 34v layers: Global maps for January 2006

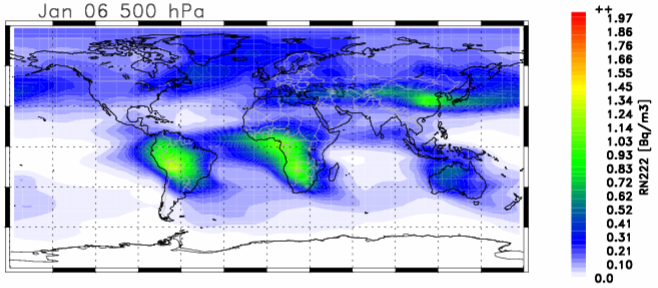


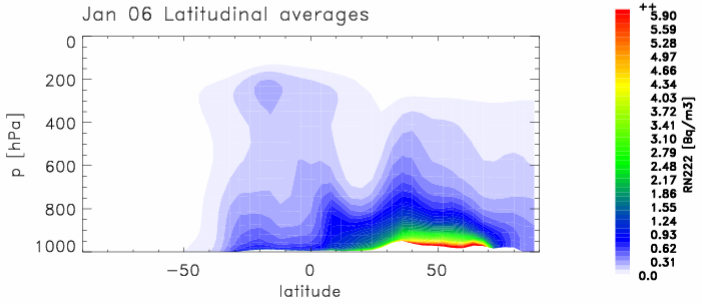




TM5 v25







TM5 v34

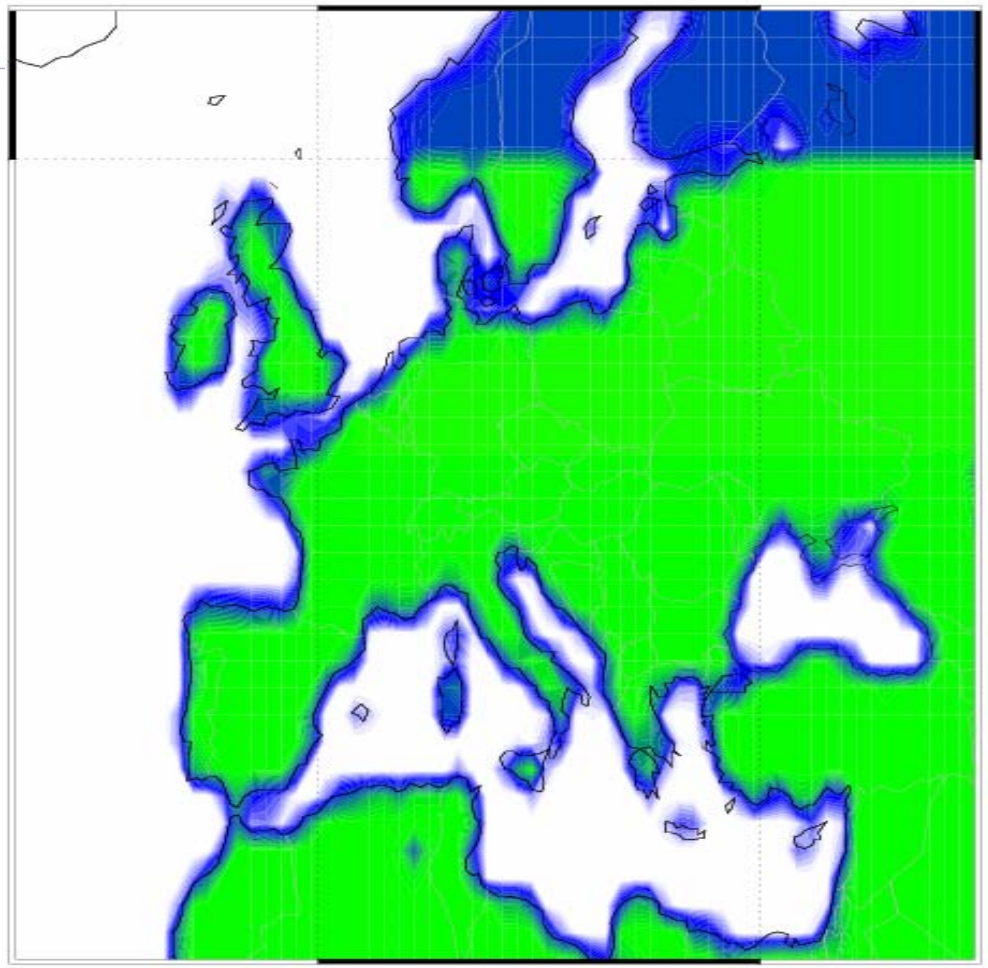
Simulations of ^{222}RN: TM5 sensitivity

1.Vertical Diffusion “parameterization”

2.TM5 v25 versus v34 vertical layers:

3. Using different ^{222}RN inventories & TM5 v34:
- Global ^{222}RN inventory 1x1 deg (annually averaged)
- European ^{222}RN inventory 0.5x0.5 deg (weekly averaged) from Basel
- Simulations 2006 year
- Global domain 6x4 deg, two zoom regions: eur 3x2, eur1x1

TM5: different ^{222}RN inventories: annually averaged inventory-standard inventory



- 1 atom cm^{-2} s^{-1} [-60ºS, 60ºN]
- 0.5 atom cm^{-2} s^{-1} [60ºN,70ºN]
- other surfaces: 0 (seas included)

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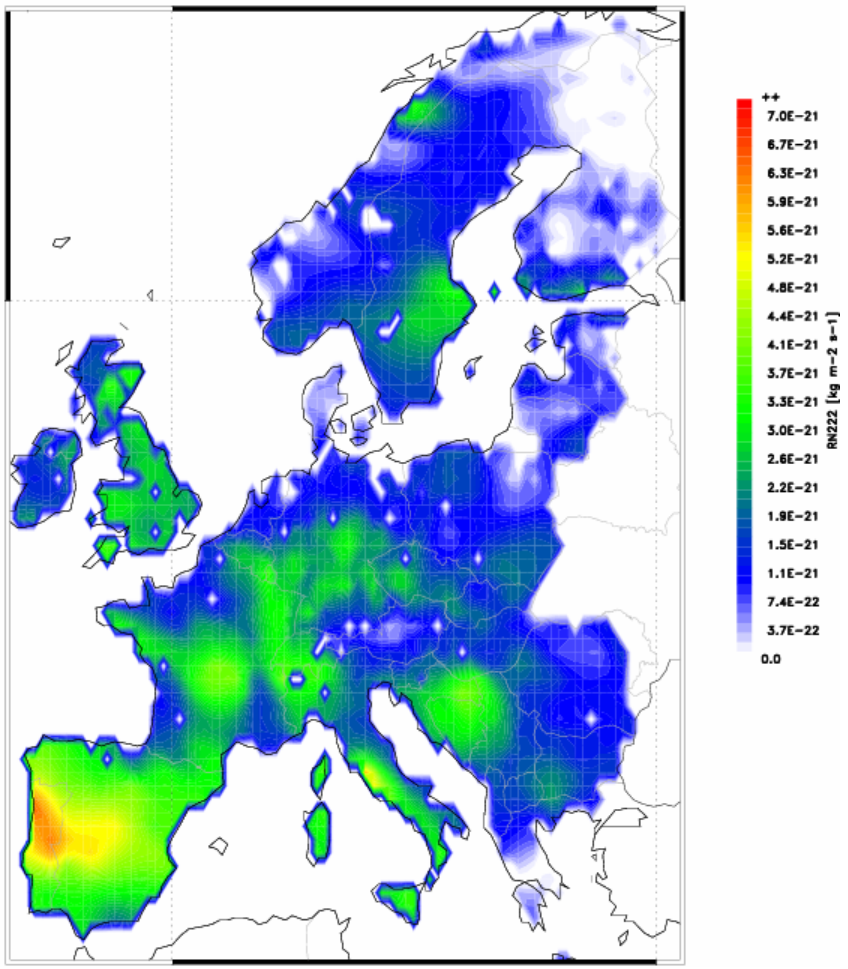
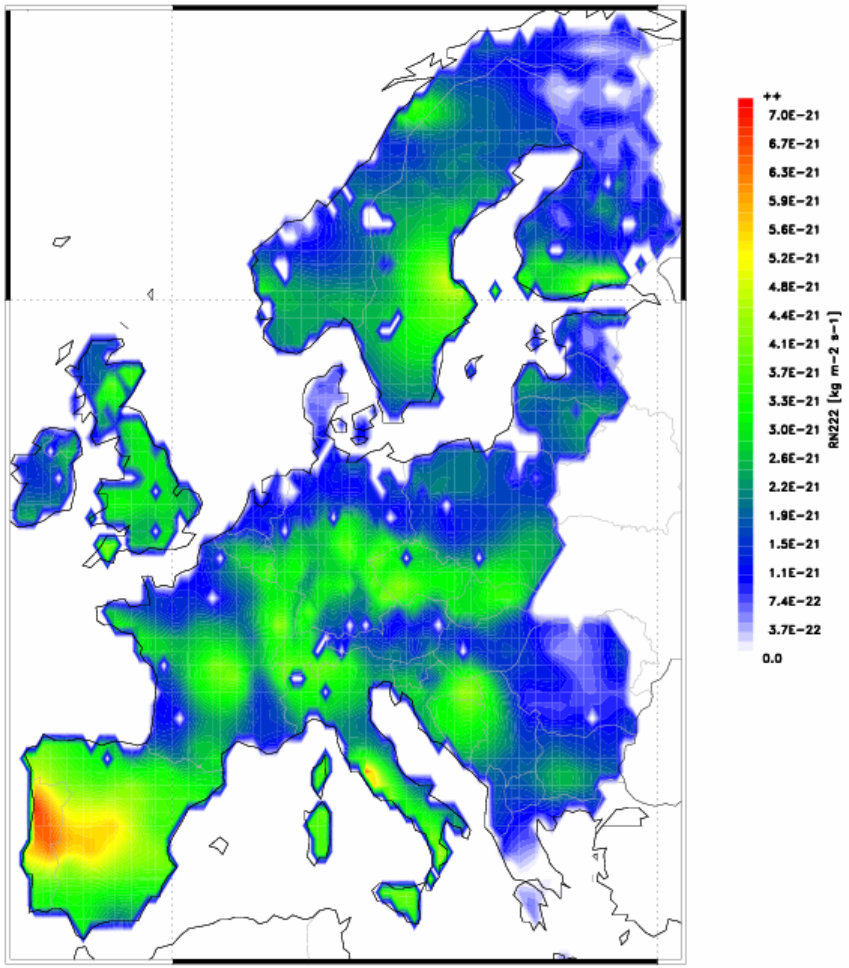
TM5: different ^{222}RN inventories: weekly averaged inventory from Basel

February 2006

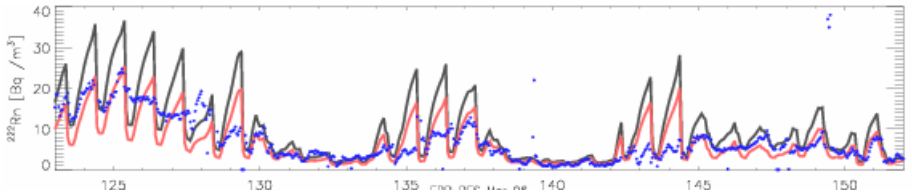


July 2006



TM5: different ^{222}RN inventories

February 2006



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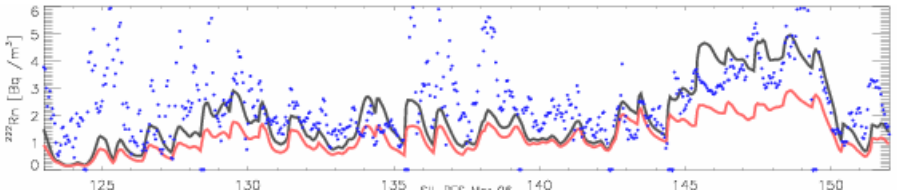
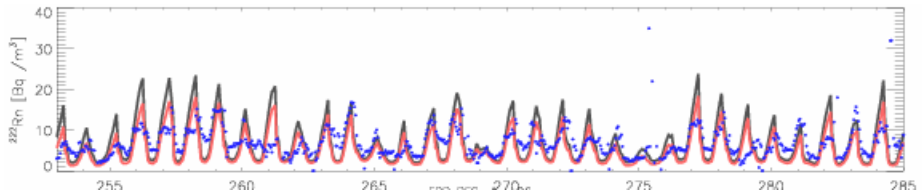


Pink: Basel inventory
Grey: standard inventory

July 2006



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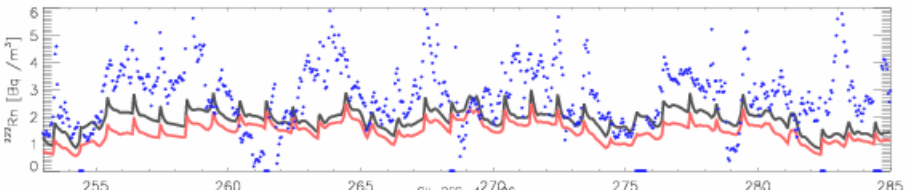
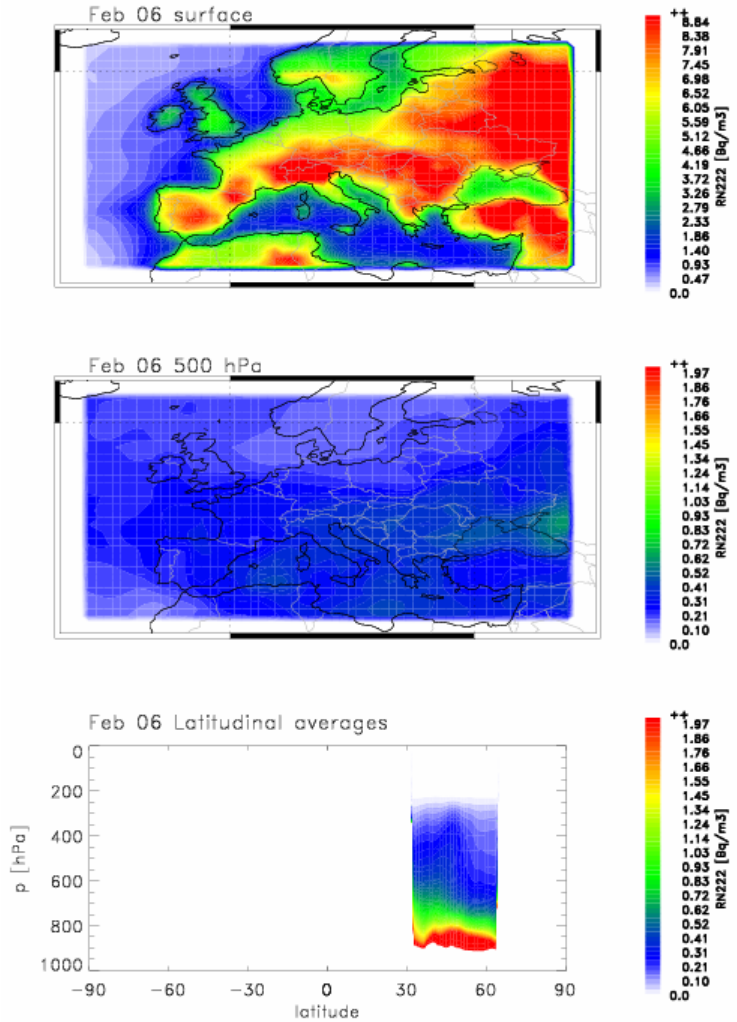


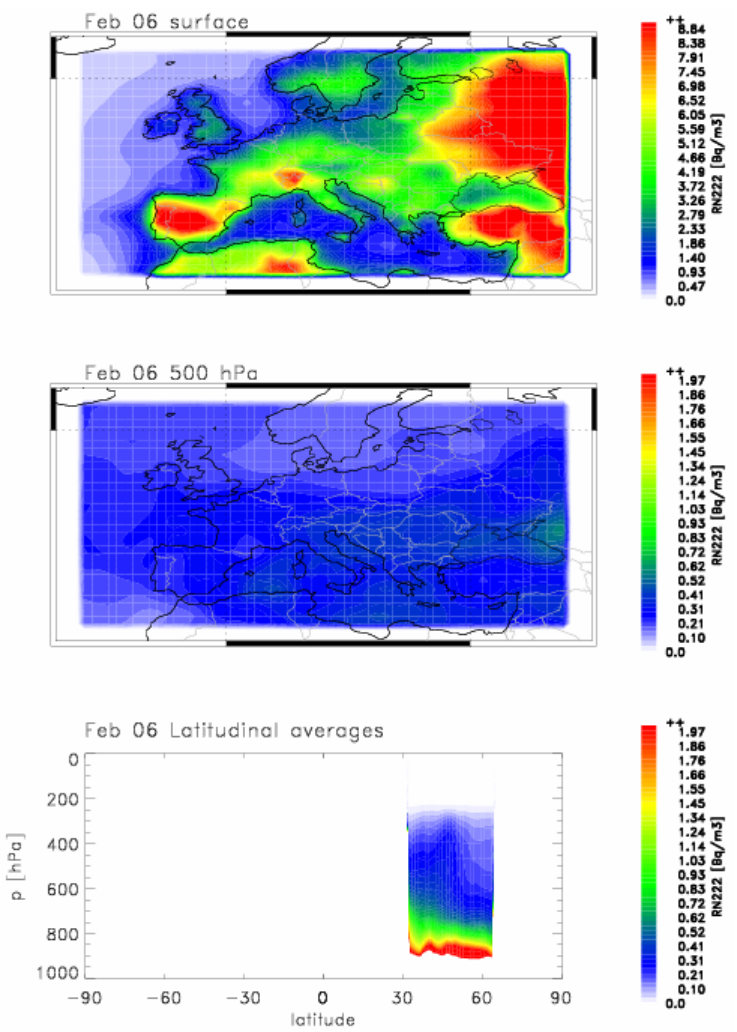
Freiburg

Schauinsland

TM5: different ^{222}RN inventories

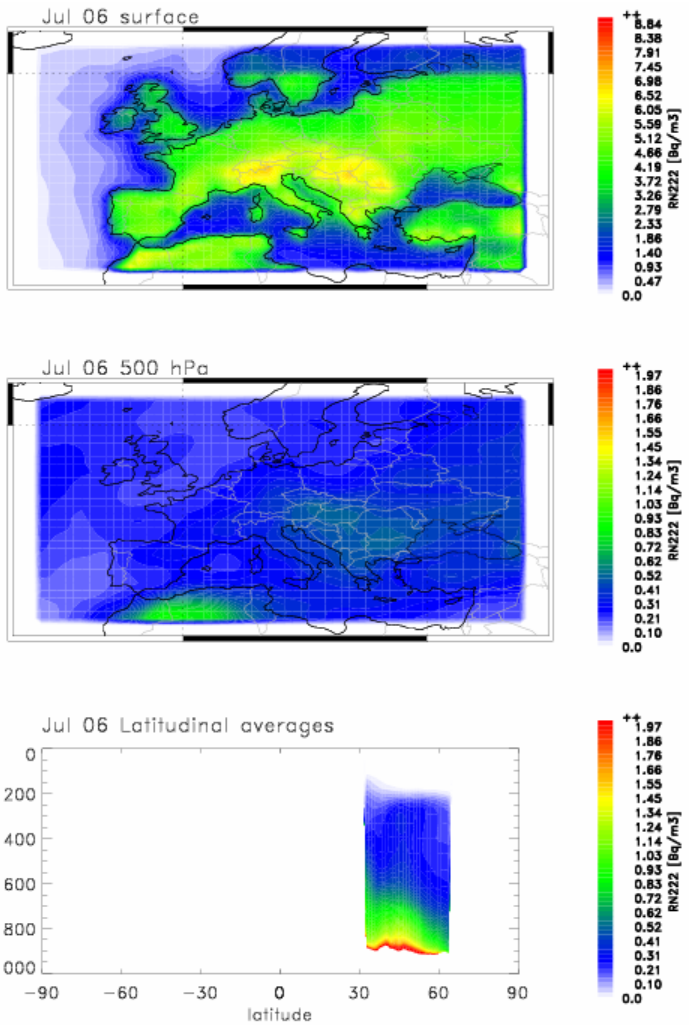


From standard inventory

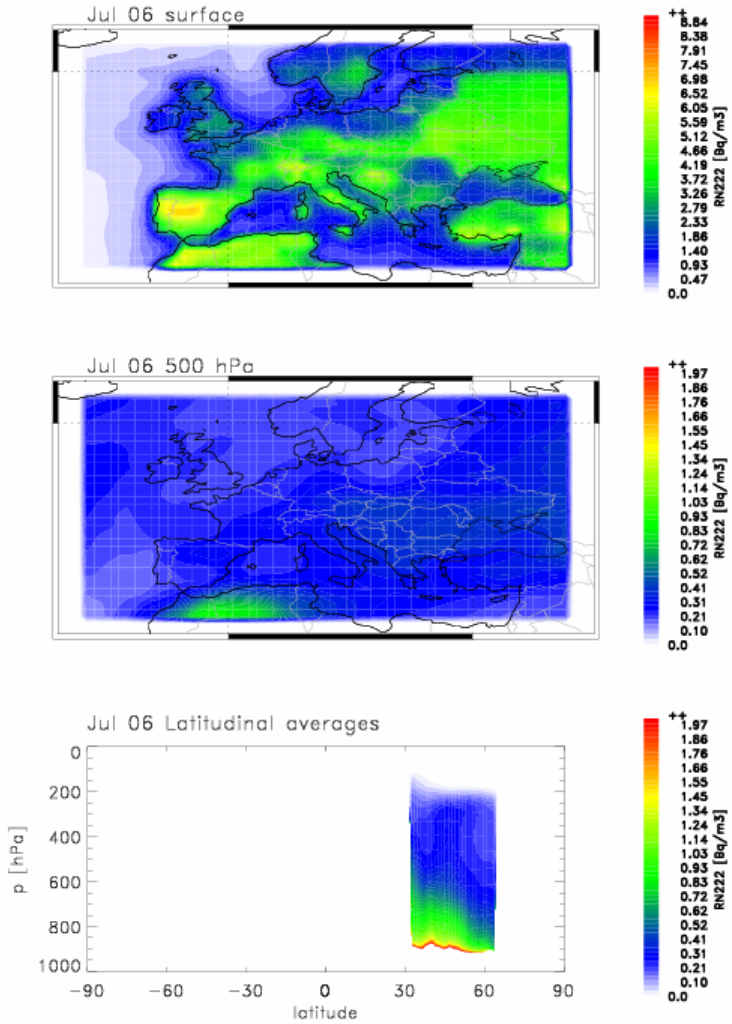


From Basel inventory

TM5: different RN 222 inventories



From standard inventory



From Basel inventory

Conclusions:

1. Vertical diffusion parameterization:
Corrected bug in diffusion sub. by WP produces major differences in surface concentrations

2. Comparisons between TM5 v25 versus v34 vertical layers: differences to be evaluated in a more quantitative way.
Discrepancies for surface stations

3. First results of simulations based on the use of different ^{222}RN inventories: conclusions still to be reached yet.
- quantitative analyses
- more observations are needed
- intercalibrations of observations