TM5-4Dvar-T36-Pyshell

Integration, possibilities, and first tests

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Starting point

- T36-4dvar version (JRC)
- cy1-4dvar version + Pyshell (Utrecht)
- Merge and try to benifit from both

Code-sprint Wageningen

- Definition of temporary emission input file:

```
group CO2
  {
  group glb6x4
    {
    dim: n_lon, n_lat
    dim : n_cat
    group cat1 // bio-mass burning
      {
      dim : n_time
      var : emission(n_time,n_lat,n_lon)
      var : auxilary variables
      }
    group cat2 // traffic
      {..}
    }
  group eur3x2
    {..}
  }
group CH4
  {..}
```

Categories per region
Flexible optimization Δt

emission.glb600x400.categories : 1

emission.glb600x400.category1 : total : 250.0 : 1000.0-g : 9.50-e-daily+2 : 1 : def-def-0

emission.bor300x200.categories : 1

emission.bor300x200.category1 : total : 250.0 : 1000.0-g : 9.50-e-daily+2 : 1 : def-def-0

emission.bow100x100.categories : 1

emission.bow100x100.category1 : total : 250.0 : 1000.0-g : 9.50-e-daily+2 : 1 : def-def-0

Provide emissions, do not optimize

emission.glb600x400.categories : 1

emission.glb600x400.category1 : total : 250.0 : 1000.0-g : 9.50-e-daily+7 : 1 : def-def-0

emission.bor300x200.categories : 2

emission.bor300x200.category1 : rest : 250.0 : 1000.0-g : 9.50-e-monthly : 0 : def-def-0

emission.bor300x200.category2 : biomass burning : 250.0 : 200.0-g : 0.62-e-daily+2 : 1 : def-def-0

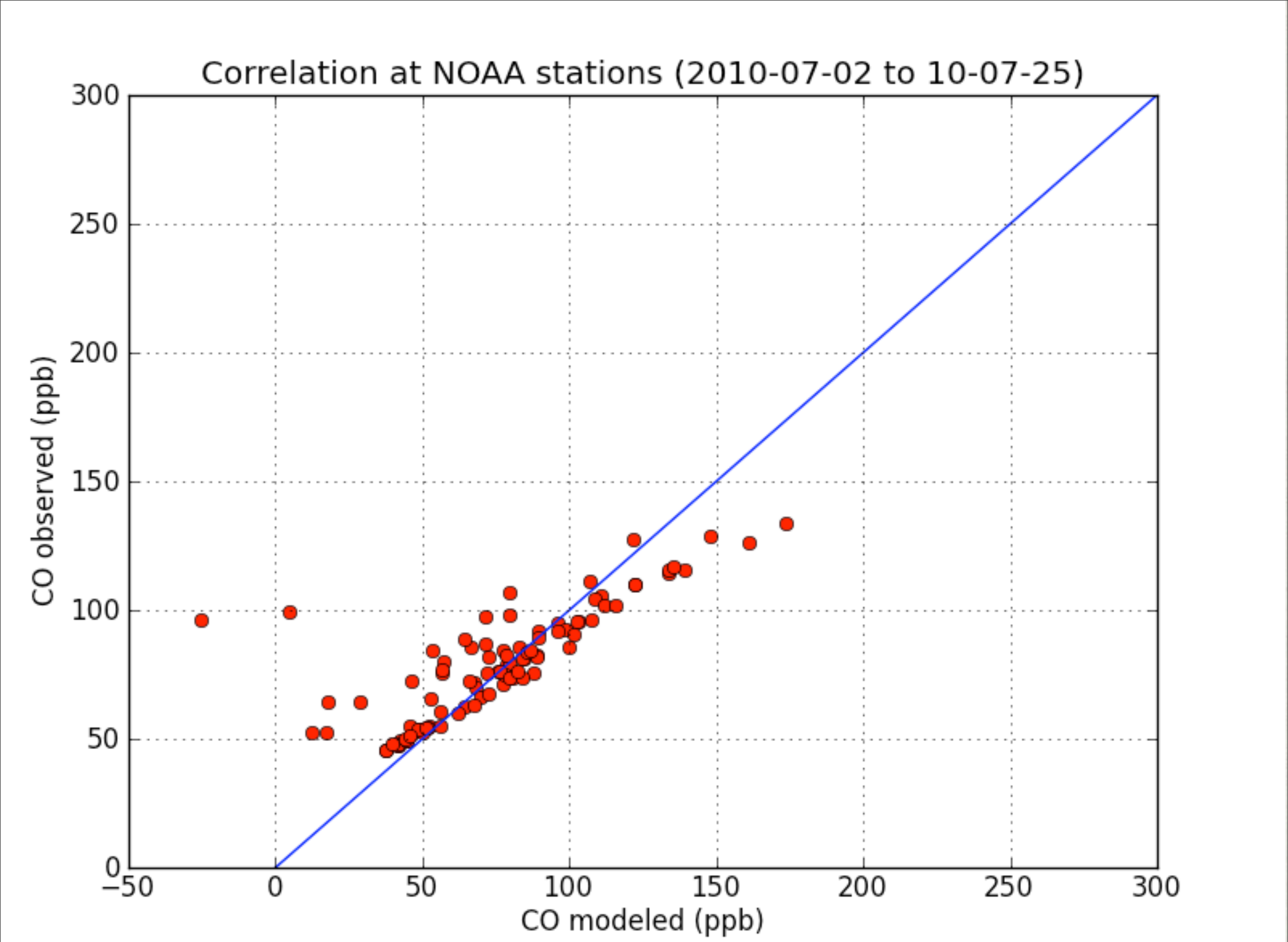
emission.bow100x100.categories : 2

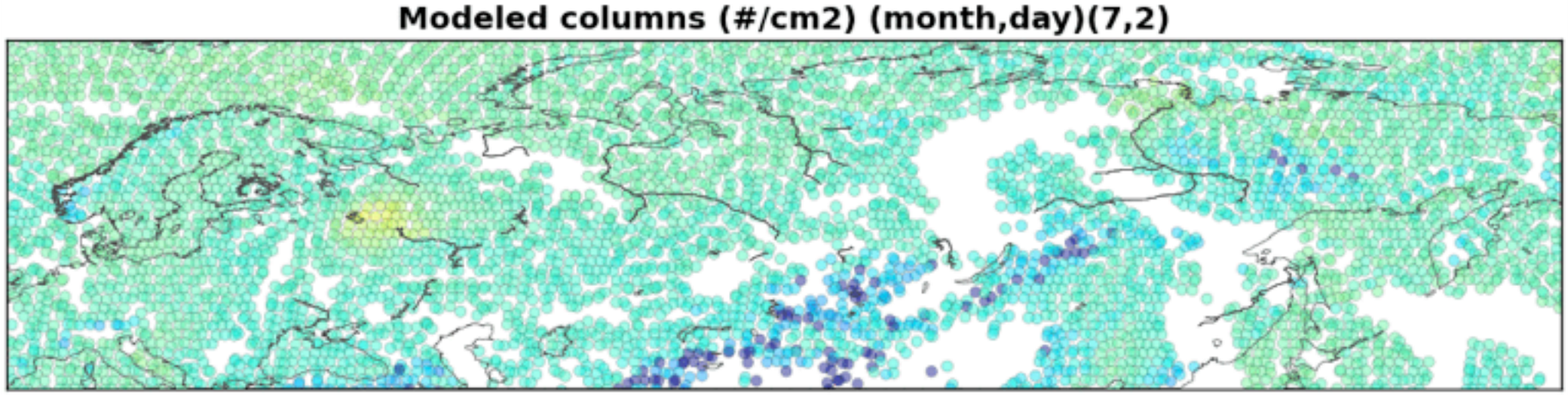
emission.bow100x100.category1 : rest : 250.0 : 1000.0-g : 9.50-e-monthly : 0 : def-def-0

emission.bow100x100.category2 : biomass burning : 250.0 : 200.0-g : 0.62-e-daily+2 : 1 : def-def-0

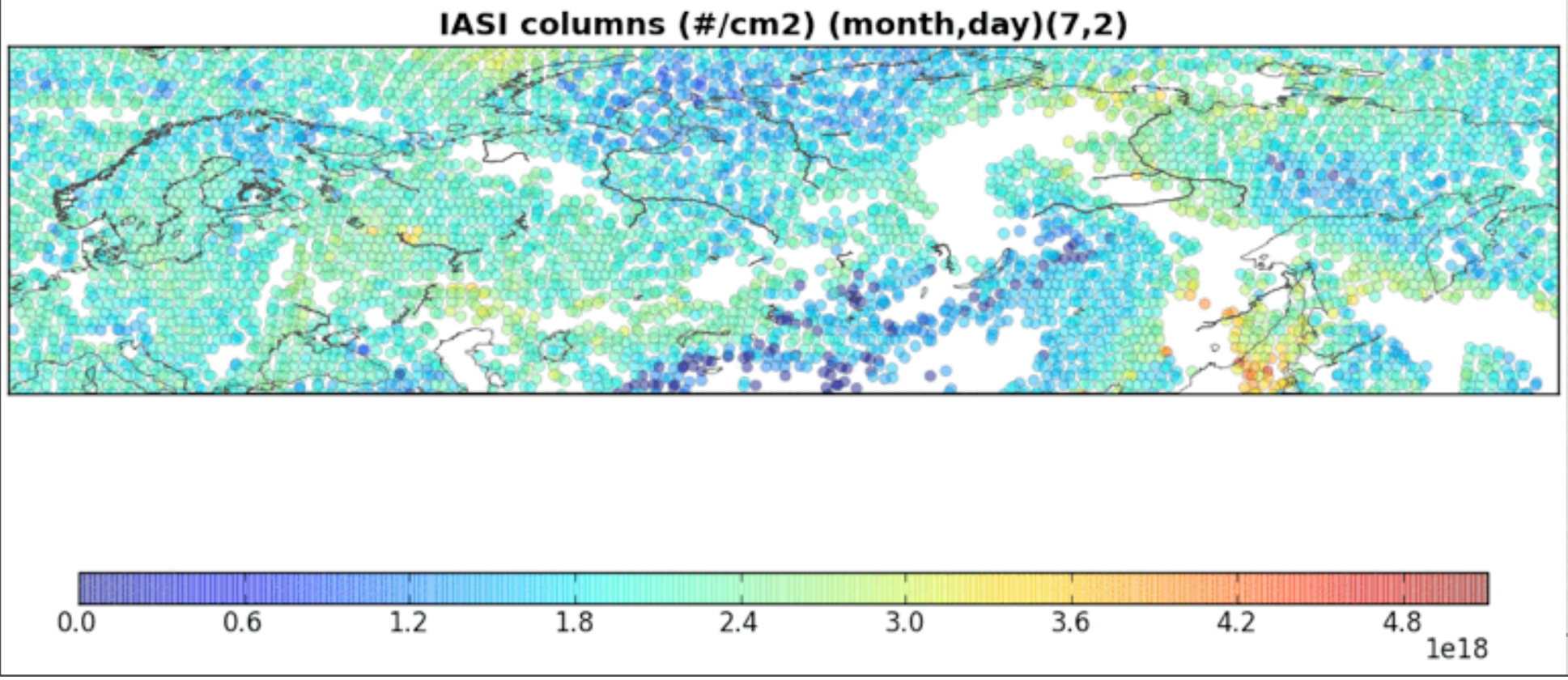
Choices

- Per region: (n) categories
- Per category: cor-len, t-cor
- Correlations between regions:
  - Only if same “name”, “cor-len”, “t-cor”
- Also possible to optimise “cat” only in zoom


Correlation at NOAA stations (2010-07-02 to 10-07-25)
CO observed (ppb)
CO modeled (ppb)
300
250
200
150
100
50
0
−50
0
50
100
150
200
250
300

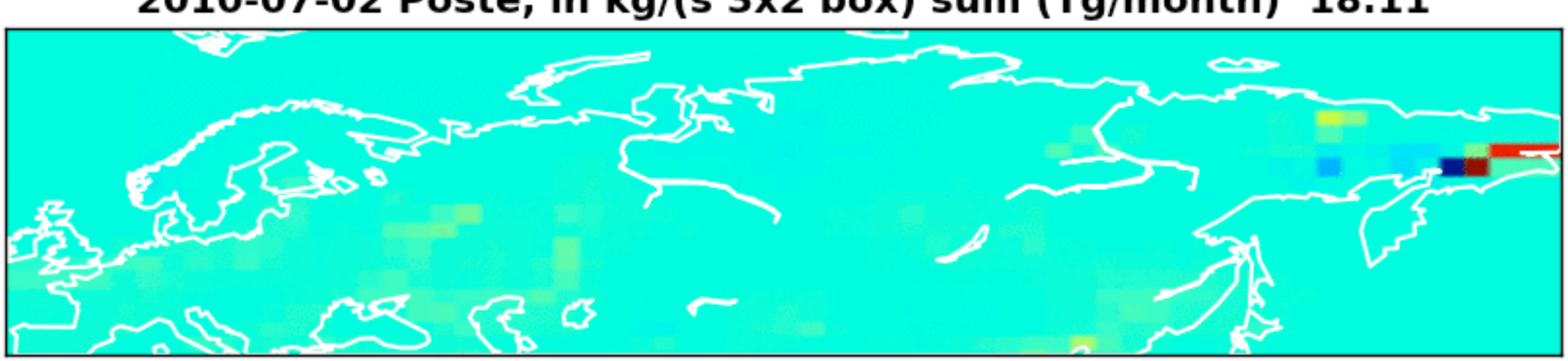


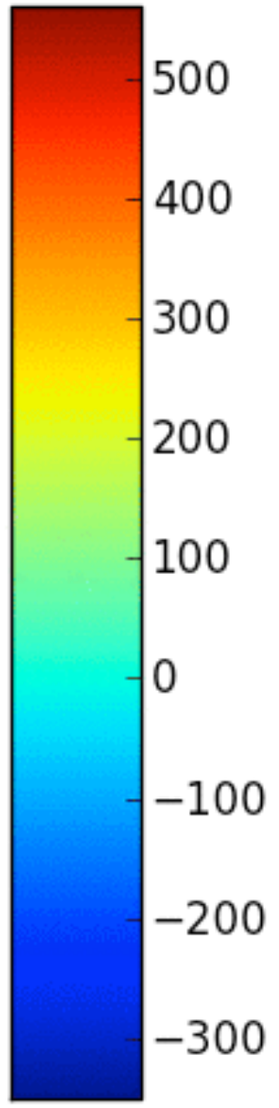
OPTIMIZATION USING IASI (SPINUP RUN)



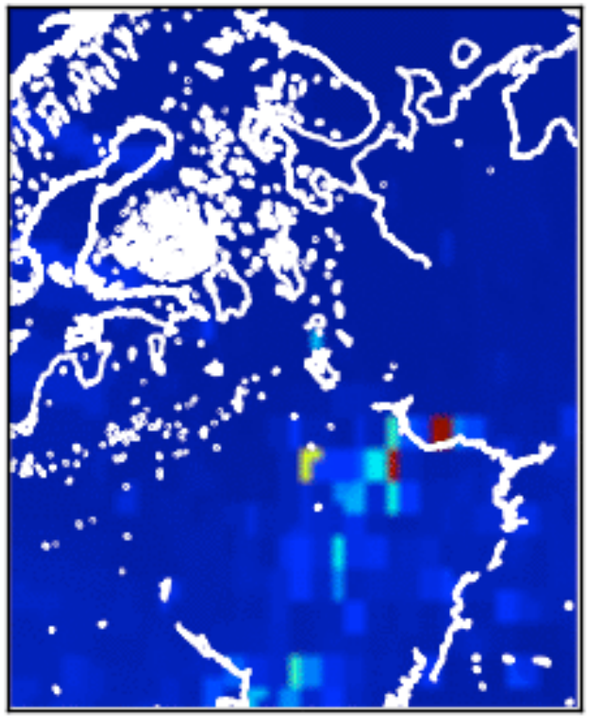
2010-07-02 Prior in kg/(s 3x2 box) sum (Tg/month) 27.37

2010-07-02 Poste, in kg/(s 3x2 box) sum (Tg/month) 18.11

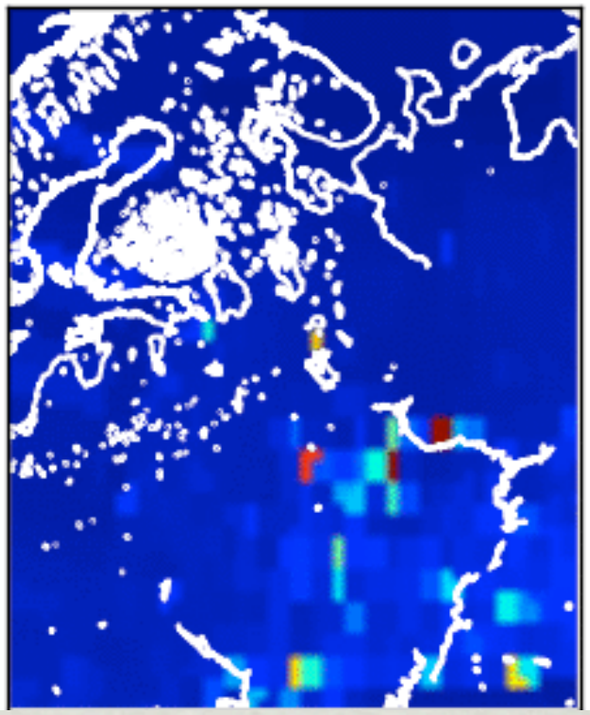


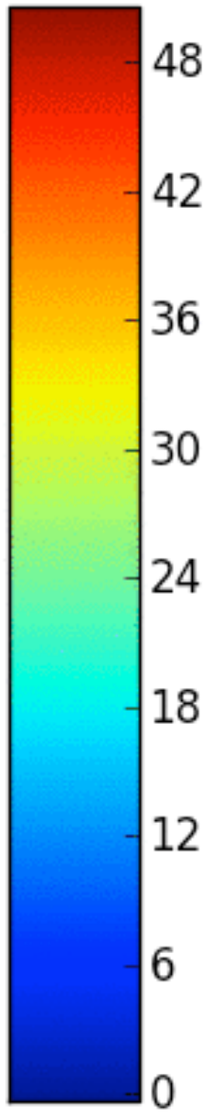


2010-07-02 Prior in kg/(s 1x1 box) sum (Tg/month) 3.76

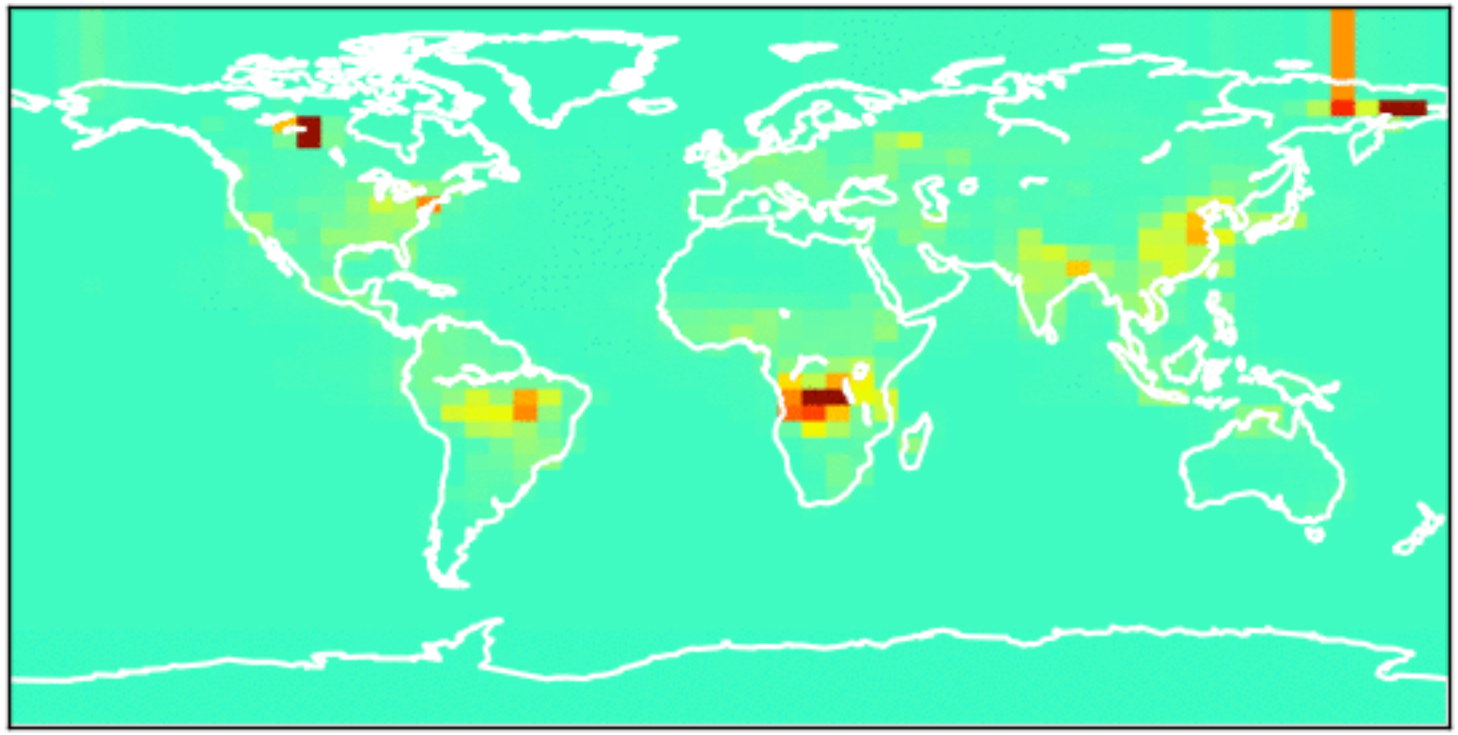


2010-07-02 Poste, in kg/(s 1x1 box) sum (Tg/month) 5.91

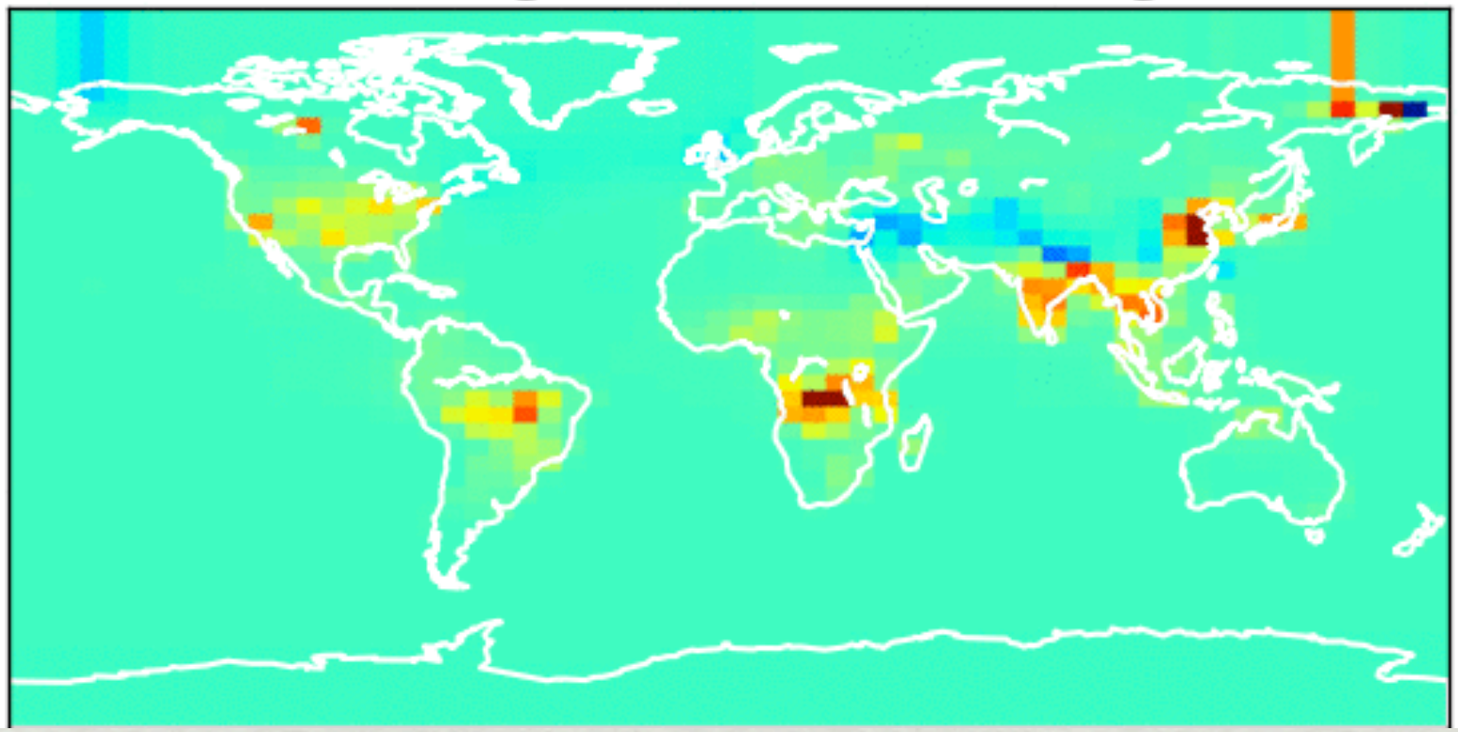


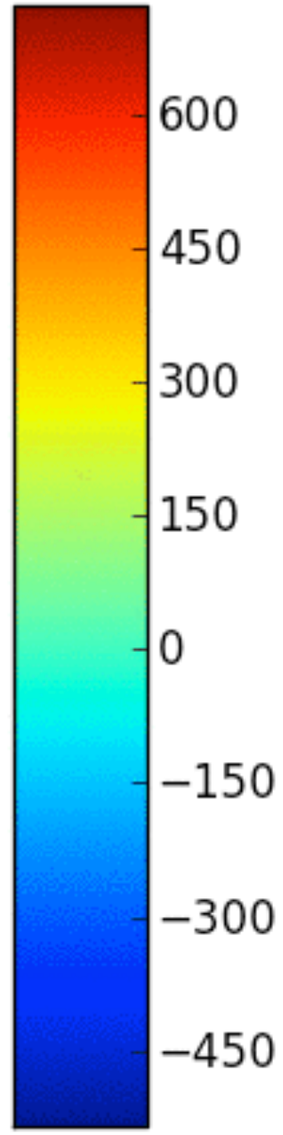


2010-07-02 Prior in kg/(s 6x4 box) sum (Tg/month) 135.40



2010-07-02 Poste, in kg/(s 6x4 box) sum (Tg/month) 132.80



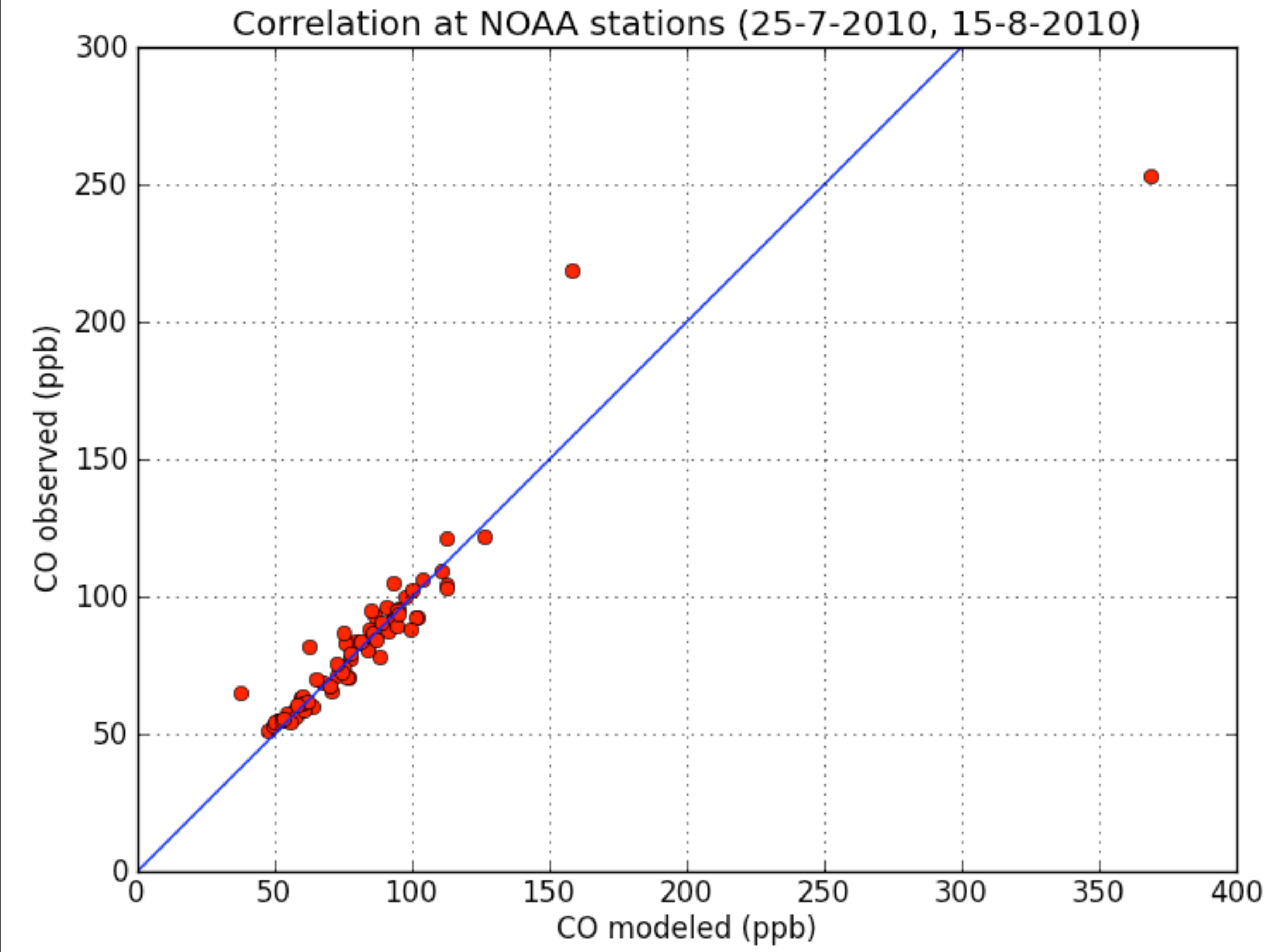


Observations

- Patters are mostly scaled, not modified
  - errors proportional to emissions
    - long correlation lengths
- Negative emissions occur, mostly in 6x4 region
  - Due to IASI or poor initial condition?

Proposed ALANIS strategy (for discussion)

- Create initial field by optimizing only category ‘total’ on the zoom domain (using IASI data + NOAA)
- Run with NOAA-stations only to optimize the global emissions (e.g. only global 6x4)
- Fix the global emissions, and use IASI + NOAA to optimize boreal biomass emissions, only in zoom


Correlation at NOAA stations (25-7-2010, 15-8-2010)
CO observed (ppb)
CO modeled (ppb)
0
50
100
150
200
250
300
350
400