

TM5 at NOAA ESRL

progress update TM meeting June 19th

General

- Five TM5 modelers now active at NOAA on: CO₂ (Wouter, Andy), CH₄ (Lori), CO (Gabrielle), CO₂ isotopes (John)
- All NOAA users on TM5 CVS system now
- NCEP reanalysis meteo preprocessed for 2000-2005, can make available to others
- Four (+2 upcoming) proposals with TM5 submitted (NASA, Dept of Energy, Dept of Commerce), one currently funded (NASA, 2006-2009): long-term TM5 commitment by NOAA!

CO₂: Wouter and Andy

- Ensemble system now published in JGR
- Next: set of ~20 sensitivity experiments to determine robustness: system overview paper
- Fires from GFED/van der Werf/CASA included
- Optimized 1x1 fluxes nearly ready for publication
- Application to European domain: Maarten
- CO₂ Proposals submitted for 2007-2010 period:
 - ingest AmeriFlux eddy-covariance time series
 - support of OCO mission + assimilation

CH₄: Lori

- Forward model is set-up, 20-year run of source-separated tracers to determine inter-annual gradients and network sensitivity finished
- Ensemble system adjusted to estimate CH₄ fluxes this year: collaboration welcome!
- Question: How do we establish a real 'hands-on' collaboration between Lori and TM5 group?
- CH₄ Proposal: extra North American (continuous) tower measurements , (inverse) modeling in support of AIRS (...inverse modeling on AIRS columns not likely...)

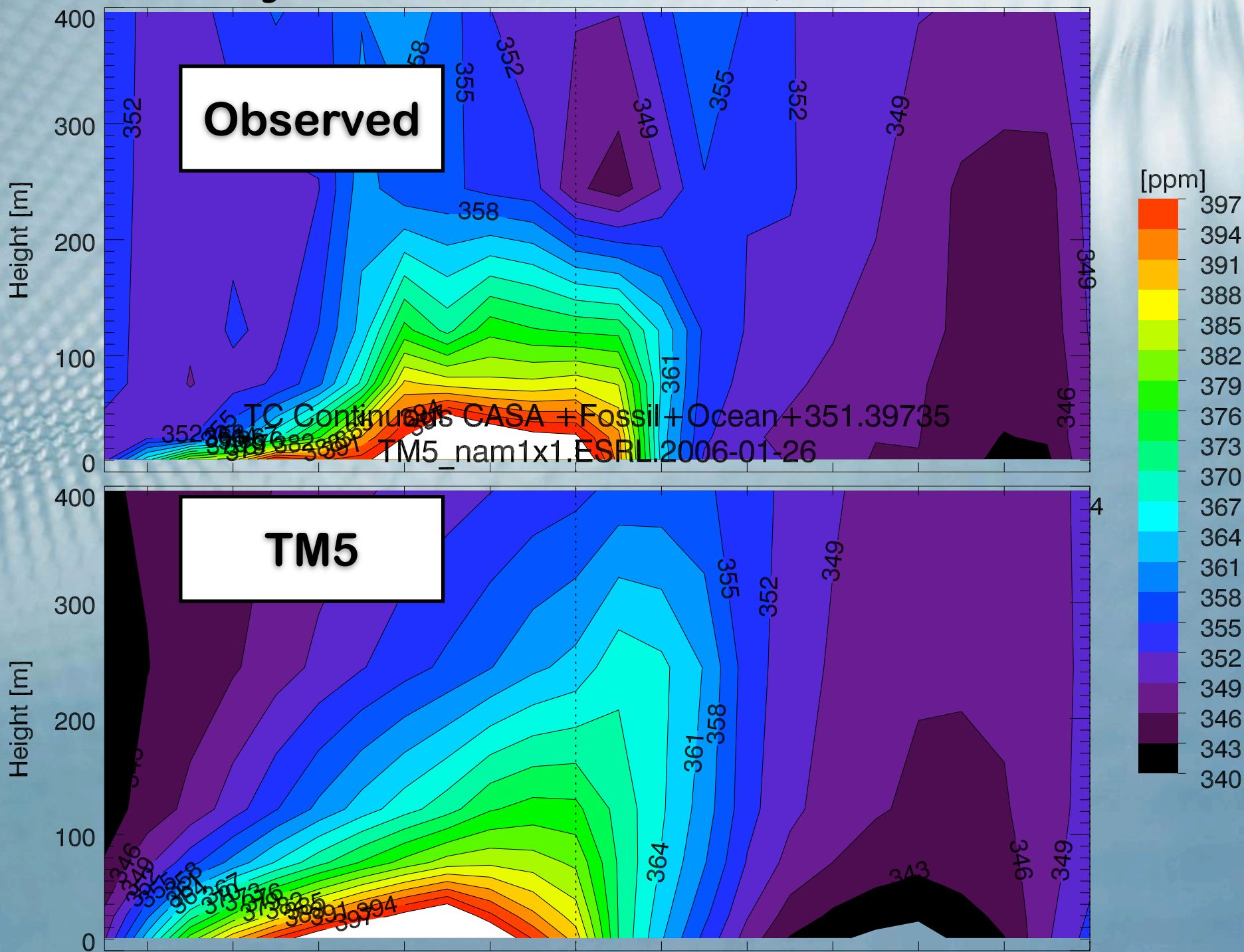
CO, fossil fuels, chemically active species: Gabrielle

- development of bottom-up emission inventories for North America (CO, CO₂, CH₄, NO_x, ...), to be optimized
- based partly on smoke-stack mixing ratio observations (power plants), local traffic measurements, bottom-up model including temperature and energy efficiency.

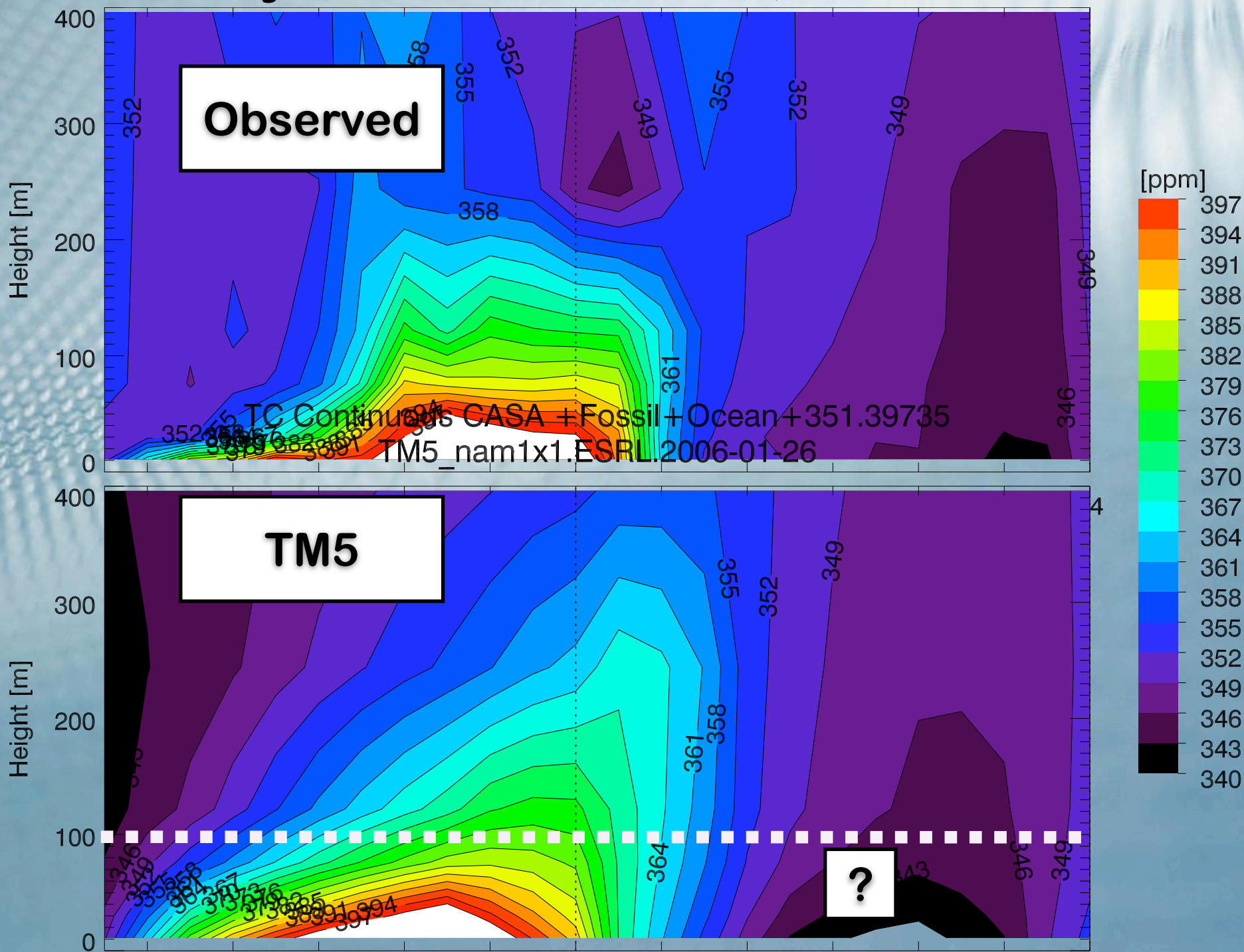
Transport studies (I)

- TC Continuous:
 - 3 TM5 entries (global3x2, eur1x1, nam1x1)
 - overview paper in preparation
 - TM5 looks really good after bug-fix! see next slide
 - TM5 with NCEP runs to follow this summer
- Optimized CO₂ vertical profiles: TM5 vertical exchange bias implied! see next slides

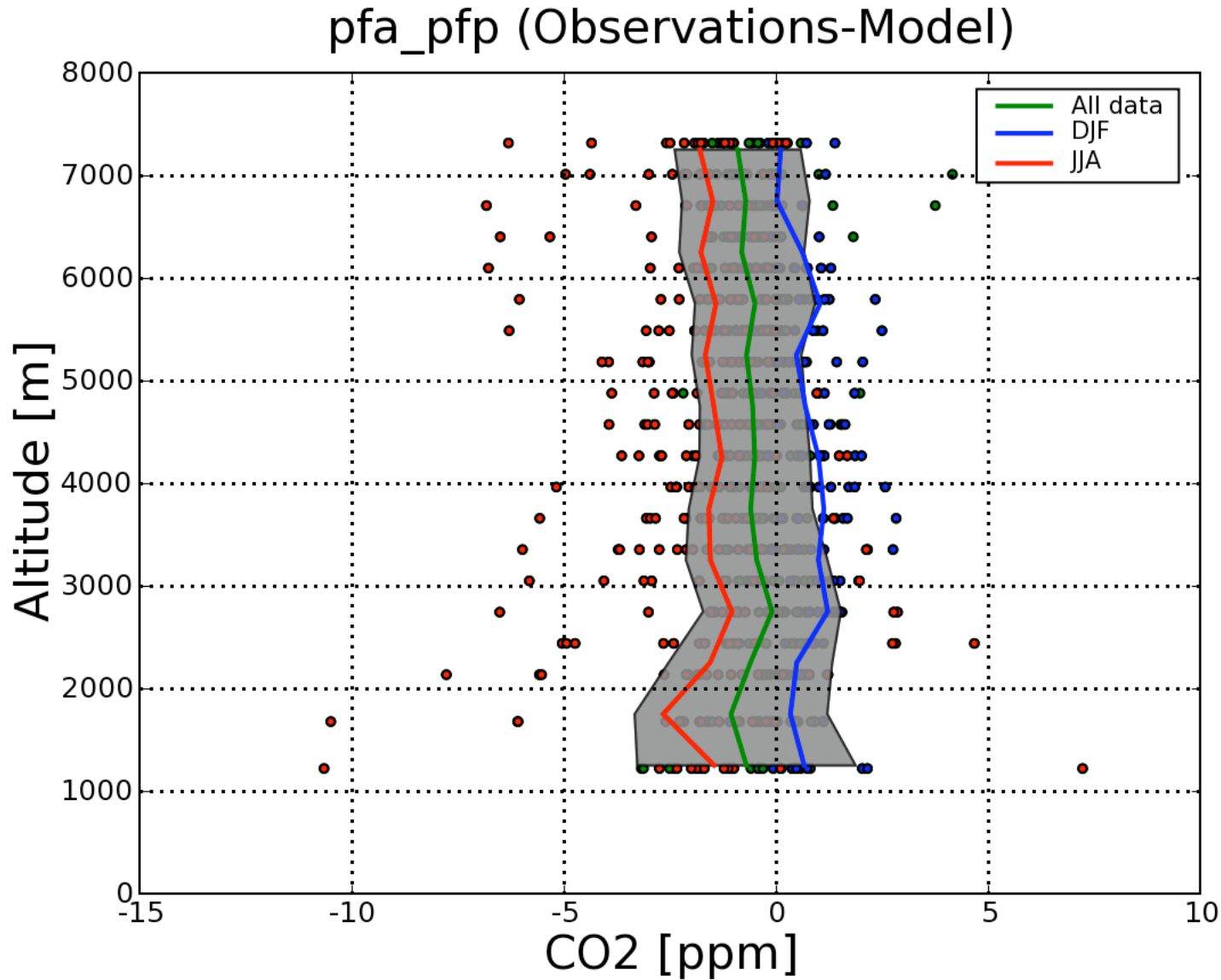
Diurnal cycle of CO₂ at WLEF, June-10th-2002



Diurnal cycle of CO₂ at WLEF, June-10th-2002



Vertical exchange bias



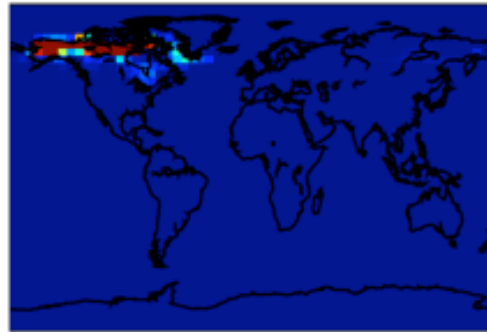
Transport Studies (II)

- Transport model uncertainty study using ensemble techniques:
 - (1) ensemble of adjoint response functions with different ζ , ζ_{etak} : large sensitivity to convection on > 1 week time scale, diffusion on < 1 week scale. Spatial gradients disappear after a few weeks independent of transport strength
 - (2) ensemble allows creation of model-data mismatch matrices (R) with off-diagonal terms isolating one aspect of uncertainty (winds, diffusion, convection, sampling,...)

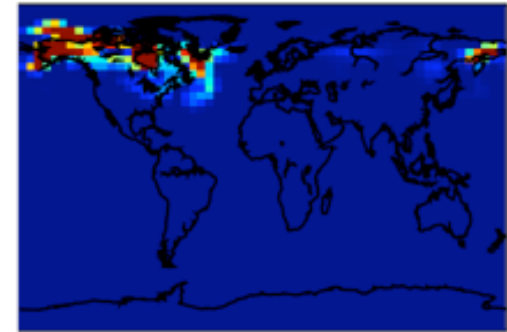
Signal (avg) of TM5 backplume from the
WLEF tower, USA for days
t-3,-6,-9,-12,-15,-18,-21,-24,-27



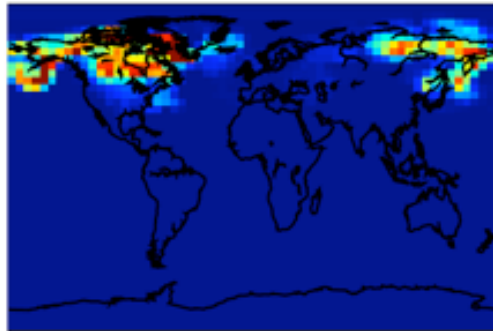
scale x4



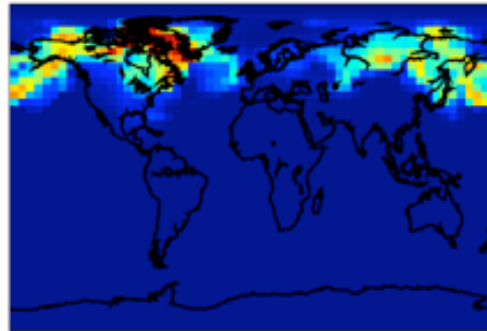
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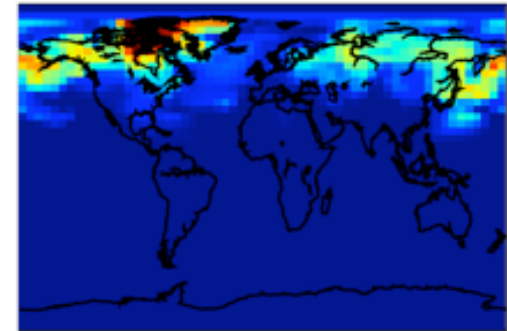
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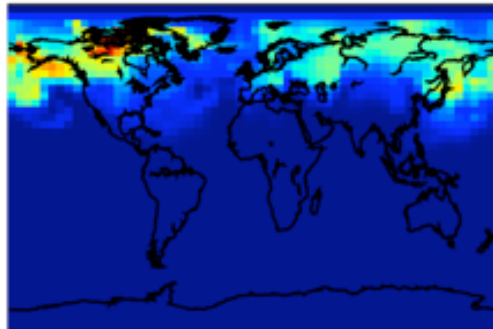
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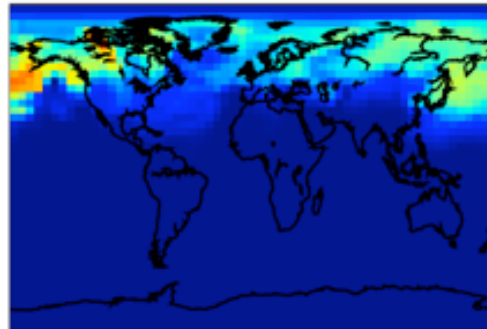
scale x20



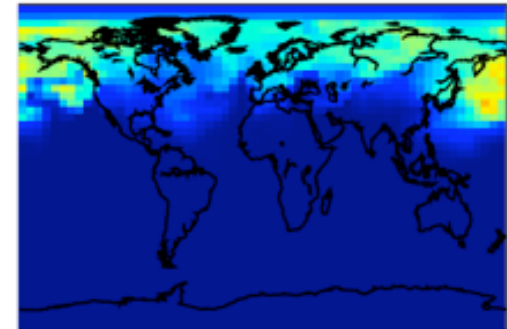
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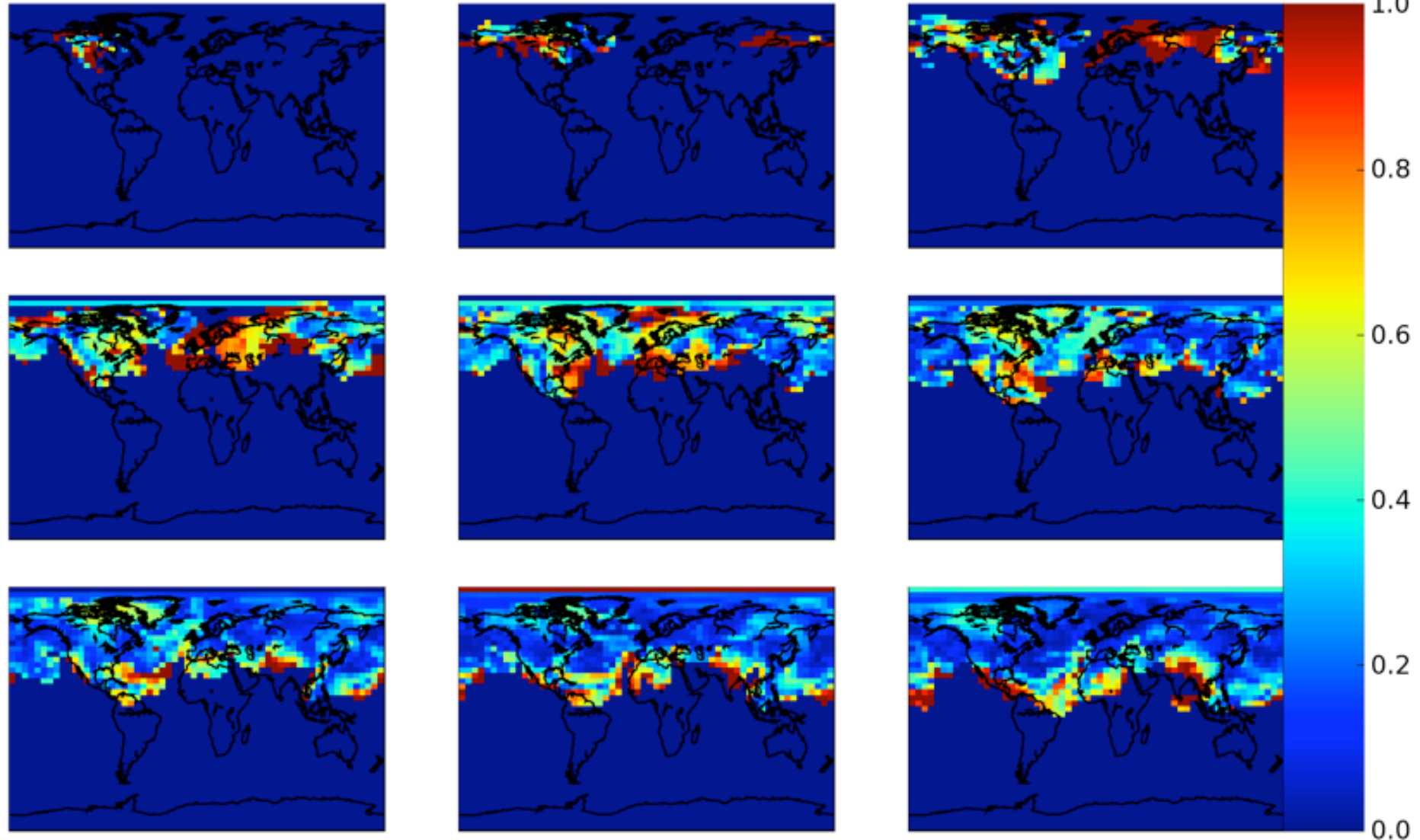
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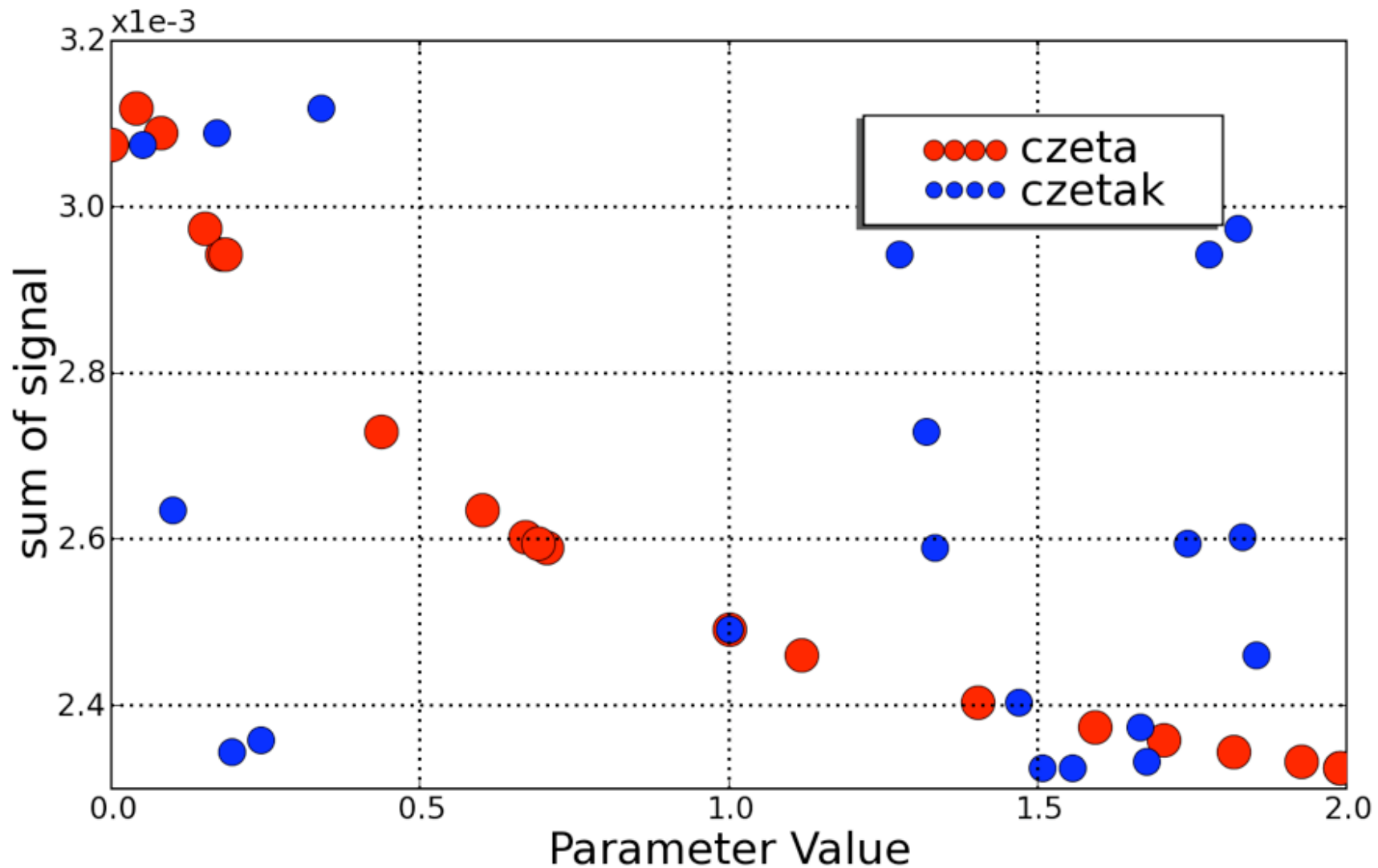
scale x32



Signal-to-Noise (stddev/avg) of TM5 backplume from the WLEF tower, USA for days t-3,-6,-9,-12,-15,-18,-21,-24,-27



Convection vs Diffusion influence



Discussion points:

- New TM5 version has been benchmarked against 'old' to get same results (using TC continuous)
- New TM5 is bigger, better, ...but not faster
- 6% loss of speed in a 10 tracer no-chemistry run
- Discussion:
 - how do we fix the speed, and who will take care of optimization after updates?
 - Need to establish benchmark to test (many) innovations, wind fields, new versions, etc.