Coordinated Model experiments for TF HTAP

- … this is a proposal. Experiments can be changed;
  and other experiments proposed.
- … it should be useful for TF HTAP and for modelers their selves
- … clearly defined and feasible goals.
- … should have large enough participation.
- … should have somebody to take care of the experiment
- … should have some IT infrastructure (self-testing)
- … perhaps some pilots studies by one or two models
- … learn from previous inter-comparisons
- … should bridge the gap between ‘global’ and ‘regional’

Study 1: Isolate and quantify impact of LRTAP transport processes in models using tracer studies

- Analysis of the role of continental scale mixing and frontal transport. E.g. a well constrained model experiment with artificial tracers; loosely representing ozone and aerosol formation. The studies can be performed by Lagrangian particle dispersion models, as well as 3D hemispheric/global models. It can gap the bridge between ozone, aerosol, mercury and POP models.
- 1a: inert tracers (e.g. Rn to evaluate BL mixing and compare to measurements).
  - Pb. (to link to Mercury) Also Radon with a larger lifetime (factor of 4 when arrived in the FT)
- 1b: 2 tracers with lifetime of 1 day and 20 days. Tracer 2 ("O3") is formed with a production efficiency dependent on the concentrations of Tracer 1 "NOx". For further details; see [*Krol et al.*, 2005]. Prescribed anthropogenic "NOx" emissions.
- 1c: 2 tracers representing 'SO2' and 'SO4'. Using a prescribed SO2 emission inventory, SO4 is formed on timescales representing gas phase and aqueous phase SO2 oxidation (tbd). SO4 is removed according to the wet deposition parameterization included in the model.
- 1d: CO type of tracer constrained by OH fields (Martin Schultz)
- 1e Hg box intercomparison (Perrone).
- 1f HCFCs linking to reality.

.... Keep the link with the real thing: develop diagnostic tools to evaluate 'full studies'

Study 2: Intercomparison of various methods for ozone source apportionment

- 2a: define one case study (e.g. anthropogenic emissions from Europe) to assess the results for the various methods of coloring/tagging ozone and comparison with a delta-emission method. To what extend are results for source apportionment similar (Q1a; Q2b).
- 2b: A regional scale analysis using delta emissions (e.g. ±10%). Comparison of monthly 3-D fields of ozone (precursors), aerosols; and daily fields for two specified months linking to existing aircraft campaigns. (Q1a,b,c). Estimate the uncertainty of the models from the model variability and comparison with measurements (Q3)
- 2c: To assess the impact of regional NOx (reductions) on decadal scale atmospheric chemistry: pulsed NOx experiments in various seasons and regions, e.g. [*Berntsen et al.*, 2005; *Stevenson et al.*, 2004; *Wild et al.*, 2001]. (Q1d, Q4)

Study 3: The role of natural emissions and climate change.

- 3a: An assessment of the contribution of natural versus anthropogenic emissions in and outside of main source regions, e.g.North America, North Africa, EU25; Several Asian regions
- 3b: Climate model studies assessing the role of changing climate and changing natural emissions on air-quality

Study 4: Source receptor relationships and uncertainties.

- 4a: Use one or a limited amount of models (to avoid excessive amounts of work) to establish the most important source-receptor relationships. Investigate the possibility to use adjoint models for this.
- 4b: Use multi-models to establish the uncertainty connected to the most important source-receptor relationships.
- 4c: Currently SR relationships are based on country-to-country transports. Analyze whether for the large countries of the Northern Hemisphere (e.g. USA; China, Germany) a 'regionally' resolved emission reduction approach would give a substantially different result in pollutant level in other parts of the world.
- 4d: Analyze whether downscaling of grid-based results on various resolutions yields substantially different results for country-wise source-receptor relationships. Evaluate one way coupling of high and low resolution models as opposed to 2-way nesting.

Study 5: Process understanding from models and measurements.

- Choose and analyze a limited amount of field campaigns that can provide a snapshot intercomparison for intercontinental transport modeling; focus on NOx and NOy budgets. (Q1a, Q1b).

ACCENT MEETING IN OSLO, June 2005, identified two topics for concerted modelling activities:

1. Emissions:

a) NMVOC speciation: start with two different profiles
e.g. GENEMIS/EMEP and from EDGAR2.0

b) Evaluation of the importance of emission seasonal cycle/emission injection height industrial and biomass burning

c) Evaluate the importance of the different model parameterisations and implementations of natural emissions (e.g. lightning-isoprene/terpenes)

d) Uncertainty/sensitivity to regional/sectoral emissions;
10 and 50 % emission change in USA/Asia/Europe.
Evaluate tagging techniques (source-receptor relationships)
Pulse experiments

e) Sensitivity to changes in emissions of Seasalt/Mineral/BC/OC
link to AEROCOM

f) Natural halocarbon and VOC emissions: link to SOLAS and MAP