TFMM Trend Analyses

Process & Methodology

Joint EMEP SB & WGE, Geneva Sept 14-17th 2015
TFMM Trend Assessment

- Three main chapters
  - Ozone
  - Particulate matter, acidifying and europhying compounds
  - Heavy metals and POPs

- Time line
  - Nov 2014: workshop
  - Feb 2015: methodology
  - May 2015: writing teams
  - Sep 2015: first draft
  - Dec 2015: full draft
  - Spring 2016: publication

- Supporting data
  - EMEP records agreed methodology
  - EURODELTAA3 numerical experimental plan
Trend methodology for observations

- **Common approach**

- **Specifications**
  - Data completeness: 75% of annual coverage and 75% of years covered
  - Statistical analysis:
    - Concentrations and wet deposition fluxes of Pb, Cd, Hg and B[a]P + other POPs: bi-exponential on the basis of monthly values;
    - Ozone (avg & max 8hr), NO2, PM10, PM2.5, SO2, sulphate, nitrate and carbonaceous atmospheric concentration and sulfur and nitrogen deposition (as concentration in precipitations): Mann-Kendall and Sen-Theil slope on the basis of annual values & by season

- **Process**
  - Centralised analysis (Centres) published on wiki
  - Supplemented by national expert knowledge of
    - (i) data issues, (ii) need for filtering, (iii) non-linearity and changes of slopes in the record, (iv) additional compounds, (v) add or discard sites, (vi) changes in seasonal cycles, (vii) relation with local emission changes
EURODELTATrends

- 6 regional CTMs + MSC-W
- Common setup
  - Meteorology
  - Emissions
  - Boundary conditions
- 3 tiers of experiments
  - Sensitivity (emissions & boundary conditions)
  - Full 20yr hindcast
## EURODELTA-Trends

### Key Questions

<table>
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<tr>
<th>Category</th>
<th>Questions</th>
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<tr>
<td>Model validation</td>
<td>How do model compare with observations in 1990, 2000, and 2010?</td>
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<td>How do models capture the trend in observations?</td>
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<td>Can we conclude on the uncertainties in emissions?</td>
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<td>European policy effectiveness</td>
<td>What if no emission change occurred in Europe?</td>
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<td>Did “potency” changed over the past 20yrs?</td>
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<td>Can we identify tipping points in SIA formation?</td>
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<td>Non-European influence</td>
<td>What if no emission changed beyond Europe?</td>
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<td>What is the uncertainty related to boundary conditions?</td>
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<td>Meteorological variability</td>
<td>Does meteorological variability contribute to the AQ trend over the past 20 yrs?</td>
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<td>Impacts</td>
<td>Link with effect community (health &amp; ecosystems)</td>
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<td>What model dynamical evaluation means for IAM?</td>
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EURODELTATrends

- Status of model production

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<tr>
<th>Tier</th>
<th>Scope</th>
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<tr>
<td>0</td>
<td>2010 Reference</td>
<td>7</td>
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<tr>
<td>1</td>
<td>1990-2000-2010 Sensitivity to European Emissions</td>
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<td>Sensitivity to Boundary conditions</td>
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<td>Full 20-yr trend</td>
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- Analysis ongoing
  - EURODELTAT Workshop, Nov 2015, Paris
  - TFMM Trend Assessment Report