ForeChem: An Air-Quality Forecasting Tool over Italy

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MODELS

• GLOBAL ANALYSES & FORECASTS: NCEP operational 1° x 1°
• METEOROLOGY: MM5 36-12 km resolution, 32 lev up to 100 hPa
• CHEMISTRY-TRANSPORT: CHIMERE 0.5°-0.15°, 8 lev up to 500 hPa
• ANTHROPOGENIC EMISSIONS: EMEP 0.5° and CTN-ACE 0.15°
• BIOGENIC EMISSIONS: MEGAN model

RESOURCES:
4-8 Xeon Linux PC, ~10 hours CPU/day, ~8 Gb disk/day

FORECHEM: An Air-Quality Forecasting Tool over Italy (ForeChem): first validation against ground-based observations, manuscript in preparation for Atmospheric Environment

http://pumpkin.aquila.infn.it/forechem

ALL-IN-ONE view of 3-days forecast

Select domain
ITALY 0.15° EUROPE 0.5°

Surface concentrations of relevant pollutants

Meteorology Click to enlarge

Click for animation

Surface concentrations of relevant pollutants

OZONE DAILY MAX

2-months simulation
15 May-15 July 2007

We show comparison of higher resolution simulation vs AirBase observations.

Ozone daily maxima are slightly overestimated (~7 µg/m³), especially at lower end of distribution. Average error within EPA quality criteria (bias < ±15% and error <35%). Average correlation of 0.65.

PARTICULATE MATTER

Range = 5th - 95th percentiles

PM10
PM2.5

PM10 Particulate matter is generally underestimated. The coarse fraction (PM10) by 50% and the fine (PM2.5) fraction by 35%. Average correlation is 0.62 and 0.51, for PM10 and PM2.5 respectively. The episode with elevated PM2.5 on June 5-12 is not captured by the model.

OZONE MAX
Mean bias decreases w/ lead-time, error increases, and correlation degrades.

PM10 All indices degrades w/ increasing lead-time.

ERRORS AS A FUNCTION OF LEAD-TIME

UNDER DEVELOPMENT

• Validation of a 2-months WINTER period
• Air Quality Index (EPA-like)
• Hit-rate statistics (e.g. false alarms, misses)

More details to be found in: “Curci, G.: An Air Quality Forecasting Tool over Italy (ForeChem): first validation against ground-based observations, manuscript in preparation for Atmospheric Environment”