Meteorologisk institutt
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Verification/Quality of EMEP products

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Overview

How to verify the quality of an EMEP model run?

Where to look for reference results?

How much does performance vary in between versions?

How to judge individual parameter's performance?

How to verify the quality of an EMEP model run?

Field inspection ncview on annual file

Mass budget in log file

Difference to standard output

(ncbo –y diff new.nc reference.nc)

Comparison of time series at EMEP sites

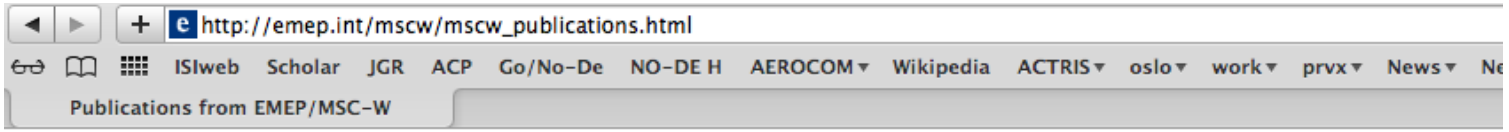
(ascii station output, EMEP data from NILU…)

Comparison to published evaluation…

Where to look for reference results? I

Supplementary material to Status Report

emep.int/mscw/mscw_publications.html



List of available publications from MSC-W

Meteorological Synthesizing Centre-West of EMEP(MSC-W of EMEP)
The Norwegian Meteorological Institute
P.O.Box 43-Blindern, N-0313 Oslo, Norway
e-mail: emep.mscw@met.no

2012	2011	2010
2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
1999	1998	1997	1996	1995	1994	1993	1992	1991	1990
1989	1987	1986	1985	1984	1983	1982	1981

Note: Publications published in co-operation with other EMEP centers are found under Common EMEP publications

Publications in 2012

EMEP Status Report 1/2012
"Transboundary acidification, eutrophication and ground level ozone in Europe in 2010"
Joint MSC-W & CCC & CEIP Report
emep_report_1_2012 (pdf 70 MB) (pdf 2 MB)

Supplementary material to EMEP Status Report 1/2012
"EMEP/MSC-W model performance for acidifying and eutrophying components and photo-oxidants in 2010"
Joint MSC-W & CCC Report
Supplementary material to emep report 1 2012 (pdf 44 MB)

Supplementary material to Status Report e.g. 2012 evaluation for 2010

Component	N_{stat}	Obs.	Mod.	Bias (%)	RMSE	Corr.
NO_2 (μg(N) m^{-3})	42	1.98	1.84	-7	0.99	0.77
SO_2 (μg(S) m^{-3})	44	0.54	0.65	21	0.62	0.37
SO_4^{2-}, sea salt corrected (μg m^{-3})	27	1.44	1.07	-26	0.46	0.93
SO_4^{2-}, including sea salt (μg m^{-3})	43	1.74	1.40	-20	0.68	0.80
NH_3 (μg(N) m^{-3})	11	0.72	0.79	9	0.42	0.51
NH_4^+ (μg(N) m^{-3})	22	1.09	0.91	-16	0.45	0.74
NH_3+NH_4^+ (μg(N) m^{-3})	35	1.45	1.25	-14	0.51	0.85
HNO_3 (μg(N) m^{-3})	12	0.10	0.09	-16	0.12	0.46
NO_3^-+HNO_3 (μg(N) m^{-3})	42	0.46	0.47	2	0.16	0.83
NO_3^- (μg m^{-3})	20	1.76	1.62	-8	0.95	0.86
SO_4^{2-} wd (μg(S)m^{-2})	57	12677	12328	-3	158	0.63
SO_4^{2-} cp (μg(S)l^{-1})	57	0.28	0.29	3	0.13	0.75
NH_4^+ wd (μg(N)m^{-2})	56	14966	12816	-14	153	0.68
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NO_3^- wd (μg(N)l^{-1})	57	12232	10892	-11	117	0.75
NO_3^- cp (μg(N)l^{-1})	57	0.27	0.25	-9	0.10	0.75
precip. mm	57	49067	48668	-1	305	0.64

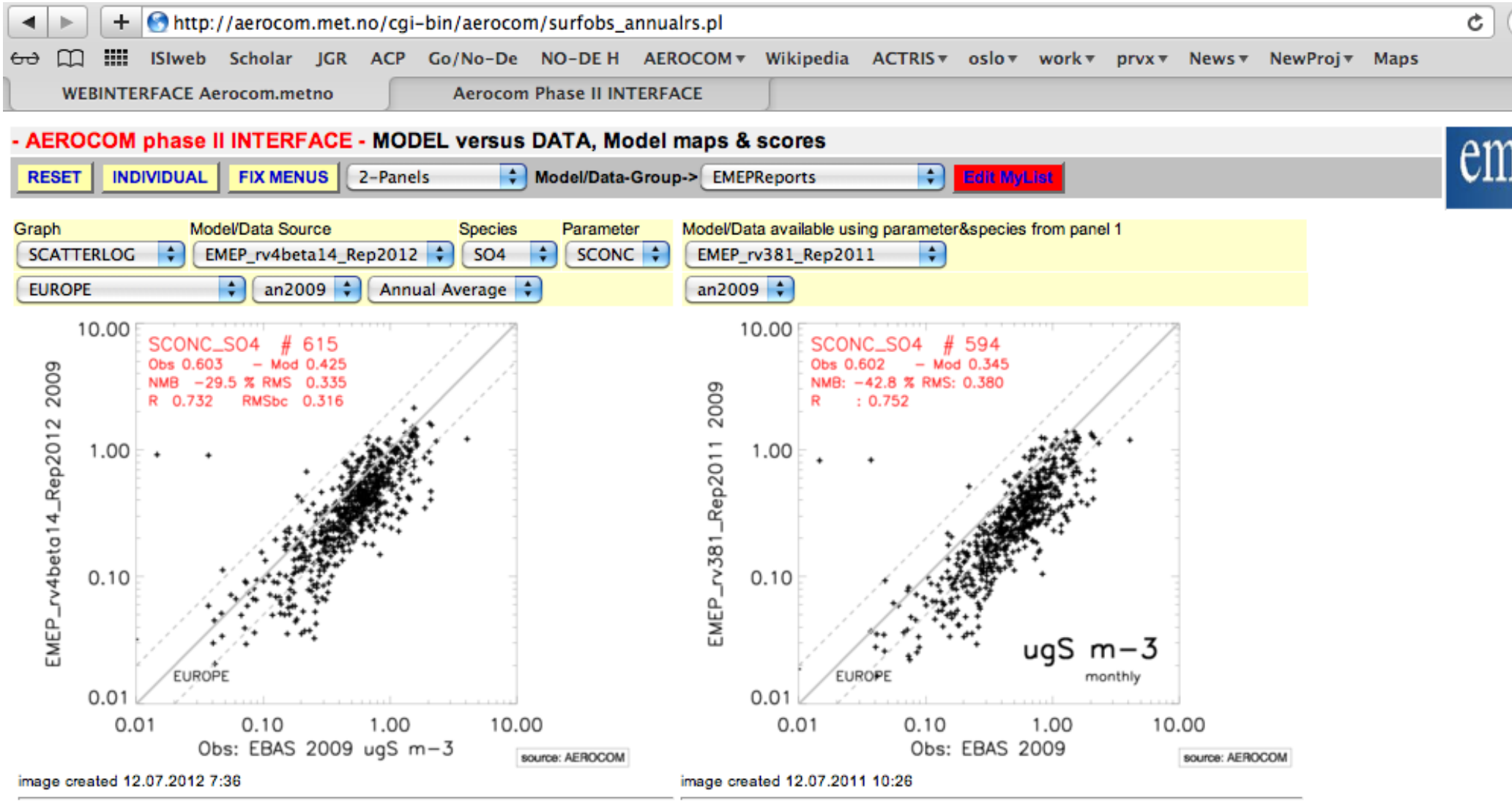
Where to look for reference results? II

Via AeroCom webinterface

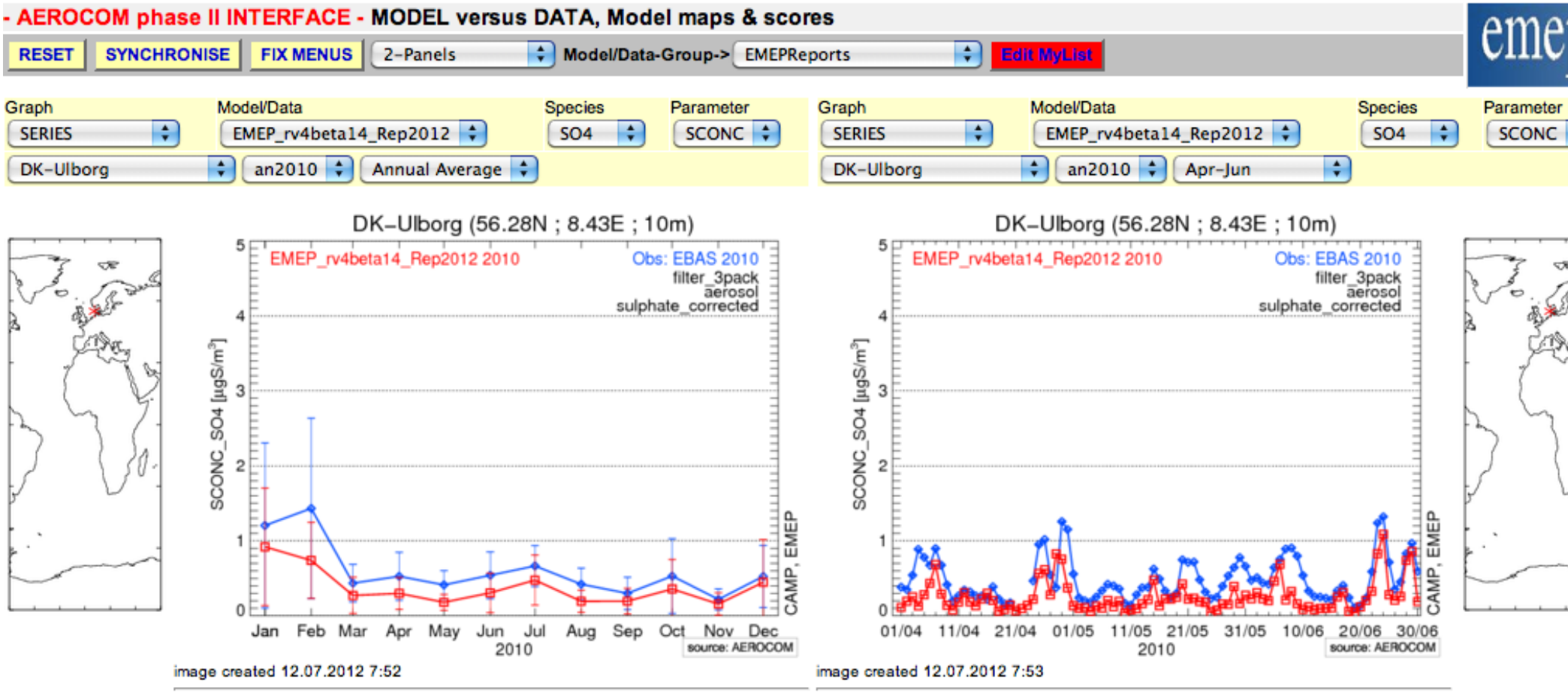
Postprocessed with idl AeroCom model intercomparison tools

Data comparisons available as time series, scatter plots, maps, bias maps, histograms…

aerocom.met.no/cgi-bin/aerocom/surfobs_annualrs.pl?MODELLIST=EMEPReports



For example: Time series check via AeroCom website



How much does performance vary in between versions?

Spatial Correlation from Validation reports over successive years

	2007	2008	2009	2010
NO3 Deposition	0.67	0.69	0.71	0.75
Total Sulfate In Air	0.64	0.64	0.74	0.80

How to judge individual parameter's performance?

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FEW data

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Deposition more uncertain than concentrations

How to judge individual parameter's performance?

SO2 Emitted species (ship emissions, stack effluents, dry deposition dependent, near detection limit)

SO_2 (μg(S) m^{-3})	44	0.54	0.65	21	0.62	0.37
SO_4^{2-}, sea salt corrected (μg m^{-3})	27	1.44	1.07	-26	0.46	0.93

SO4 Secondary species (reflecting regional emission patterns, Long range transported, produced in clouds, well mixed)

NH_3+NH_4^+ (μg(N) m^{-3})	35	1.45	1.25	-14	0.51	0.85
HNO_3 (μg(N) m^{-3})	12	0.10	0.09	-16	0.12	0.46
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NH3 Emitted species (agricultual surface emissions, dry deposition dependent, few measurements)

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NH_4^+ (μg(N) m^{-3})	22	1.09	0.91	-16	0.45	0.74

NH4 Secondary species (reflecting regional emission patterns, Long range transported, associated to LRT sulphate and nitrate

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Among all rain paramaters…
NH4 rain concentrations most uncertain
Contamination problem in handling?
Dry deposition of NH3 in samples?

What is the (un)certainty of the N deposition model ? "*User*" *question, Quote David Simpson:*

It is very difficult to assess the uncertainty of atmospheric chemical transport models (CTMs) for deposition, mainly due to a lack of data on dry deposition. For wet-deposition, Simpson et al. (2006) found that the EMEP model's wet-deposition of NO3 and NH4 were within 20-30% of observed values at ICP-forest sites, or 10-23% lower when compared to the EMEP/ CCC network. For dry-deposition, Flechard et al (2011) compared four different deposition-modules (including an early EMEP scheme) in an inferential approach, making use of data from 55 sites across Europe. This study found differences of the order of 2-3 between the models, with estimates for particle deposition over forests showing especially large differences. Estimates of total deposition should of course be more robust than those of dry deposition, and analysis of the results of the EURODELTA ensemble study (7 CTMs) showed standard deviations between models of about 50-200 mg/N)/m2 in regions where the ensemble mean was about 200-500 mg(N)/m2 (Simpson et al., 2011). Given that airborne nitrogen species are usually reproduced within 30% though, and given the costraints of mass-balance, a first estimate of total deposition uncertainty might be around 30-50%.

The vision

Runtime verification for reference EMEP data

Self-explanatory, automated
model performance report

Fit for purpose evaluation
"S/R probably more certain than hourly ozone"
Trend stability