

Title: Data behind Figures in “Peroxy acetyl nitrate (PAN) measurements at northern midlatitude mountain sites in April: a constraint on continental source–receptor relationships”

Abstract: Abundance-based model evaluations with observations provide critical tests for the simulated mean state in models of intercontinental pollution transport, and under certain conditions may also offer constraints on model responses to emission changes. We compile multiyear measurements of peroxy acetyl nitrate (PAN) available from five mountaintop sites and apply them in a proof-of-concept approach that exploits an ensemble of global chemical transport models (HTAP1) to identify an observational “emergent constraint”. In April, when the signal from anthropogenic emissions on PAN is strongest, simulated PAN at northern midlatitude mountaintops correlates strongly with PAN source–receptor relationships (the response to 20 % reductions in precursor emissions within northern midlatitude continents; hereafter, SRRs). This finding implies that PAN measurements can provide constraints on PAN SRRs by limiting the SRR range to that spanned by the subset of models simulating PAN within the observed range. In some cases, regional anthropogenic volatile organic compound (AVOC) emissions, tracers of transport from different source regions, and SRRs for ozone also correlate with PAN SRRs. Given the large observed interannual variability in the limited available datasets, establishing strong constraints will require matching meteorology in the models to the PAN measurements. Application of this evaluation approach to the chemistry–climate models used to project changes in atmospheric composition will require routine, long-term mountaintop PAN measurements to discern both the climatological SRR signal and its interannual variability.

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Format of data files: Data is primarily in text file format aside from a collection of gridded modeled data in netCDF format.

Location where data were collected: Included are globally modeled data as well as observational data at sites detailed in the paper.

Time period during which data were collected: Included are data from model simulations of the year 2001, and observations spanning the years 1995-2010, with further detail given in the paper.

File Information:

Seasonal cycles of modeled total PAN at sites; used in Figures 1, 3, 4, 6

allmodels_PAN_total_MtWaliguan_vinterp.txt

allmodels_PAN_total_Schauinsland_vinterp.txt

allmodels_PAN_total_Hohenpeissenberg_vinterp.txt

allmodels_PAN_total_Jungfrauoch_vinterp.txt
allmodels_PAN_total_MtBachelor_vinterp.txt
allmodels_PAN_total_Zugspitze_vinterp.txt

Seasonal cycles of modeled source-receptor relationships for PAN at sites; used in Figures, 1, 4, 5, 7

allmodels_PAN_fromEA_Jungfrauoch_vinterp.txt
allmodels_PAN_fromEA_MtBachelor_vinterp.txt
allmodels_PAN_fromEA_MtWaliguan_vinterp.txt
allmodels_PAN_fromEU_Jungfrauoch_vinterp.txt
allmodels_PAN_fromEU_MtBachelor_vinterp.txt
allmodels_PAN_fromEU_MtWaliguan_vinterp.txt
allmodels_PAN_fromNA_Jungfrauoch_vinterp.txt
allmodels_PAN_fromNA_MtBachelor_vinterp.txt
allmodels_PAN_fromNA_MtWaliguan_vinterp.txt

NetCDF PAN fields at 650 hPa; used in Figure 2

mm_htap_CAMCHEM-3311m13_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_FRSGCUCI-v01_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_GEMAQ-v1p0_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_GEOSChem-v07_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_GISS-PUCCINI-modelE_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_GMI-v02f_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_INCA-vSSz_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_LLNL-IMPACT-T5a_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_MOZARTGFDL-v2_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_MOZECH-v16_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_STOC-HadAM3-v01_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_STOCHEM-v02_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_TM5-JRC-cy2-ipcc-v1_SR1_REGRID_1x1_pan_650hPa.nc
mm_htap_UM-CAM-v01_SR1_REGRID_1x1_pan_650hPa.nc

Observational data; used in Figures 3, 4, 6

hoh_obs_gpm.csv (Hohenpeissenberg)
obs_mountbachelor_gpm.csv
obs_zugspitze_gpm.csv
pan_monthly_merge_pandey_fischer_111111.txt (Jungfrauoch)
ssl647n00.ubag.as.cn.pan.nl.mo.dat (Schauinsland)

Back trajectory attribution; used in Figure 4

PAN_source_regions_traj_attribution_97_98.txt

Regional AVOC; used in Figure 5

avoc.csv

NA vs EA CO and PAN ratios; used in Figure 6

mbo_alt_tp1x.csv

Seasonal cycles of modeled source-receptor relationships for ozone at sites; used in Figure 7

allmodels_ozone_fromEA_Jungfraujoeh_vinterp.txt
allmodels_ozone_fromEA_MtBachelor_vinterp.txt
allmodels_ozone_fromEA_MtWaliguan_vinterp.txt
allmodels_ozone_fromEU_Jungfraujoeh_vinterp.txt
allmodels_ozone_fromEU_MtBachelor_vinterp.txt
allmodels_ozone_fromEU_MtWaliguan_vinterp.txt
allmodels_ozone_fromNA_Jungfraujoeh_vinterp.txt
allmodels_ozone_fromNA_MtBachelor_vinterp.txt
allmodels_ozone_fromNA_MtWaliguan_vinterp.txt

Regionally averaged source-receptor relationships in surface air; used in Figure 8

mm_srfo3_htap_CAMCHEM-3311m13_SR1.txt
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mm_srfo3_htap_FRSGCUCI-v01_SR6EA.txt
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