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Atmospheric Chemistry and Physics Discussions

Supplement of

Comparing the CarbonTracker and TM5-4DVar data assimilation systems for CO_2 surface flux inversions

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1 Measurement Sites

Table 1 shows the measurement sites which are either assimilated in the different setups of CarbonTracker and TM5-4DVar or used in the resampling study. Figures 1 and 2 show a graphical representation of the observations used in the assimilation and used for validation in the different runs. The sites are referenced by their NOAA sitecode, as defined in OBSPACK from Masarie et al. (2014), compiled by the Environmental Sciences Division, Oak Ridge National Laboratory (2013, exact version: obspack PROTOTYPE v1.0.2 2013-01-28).

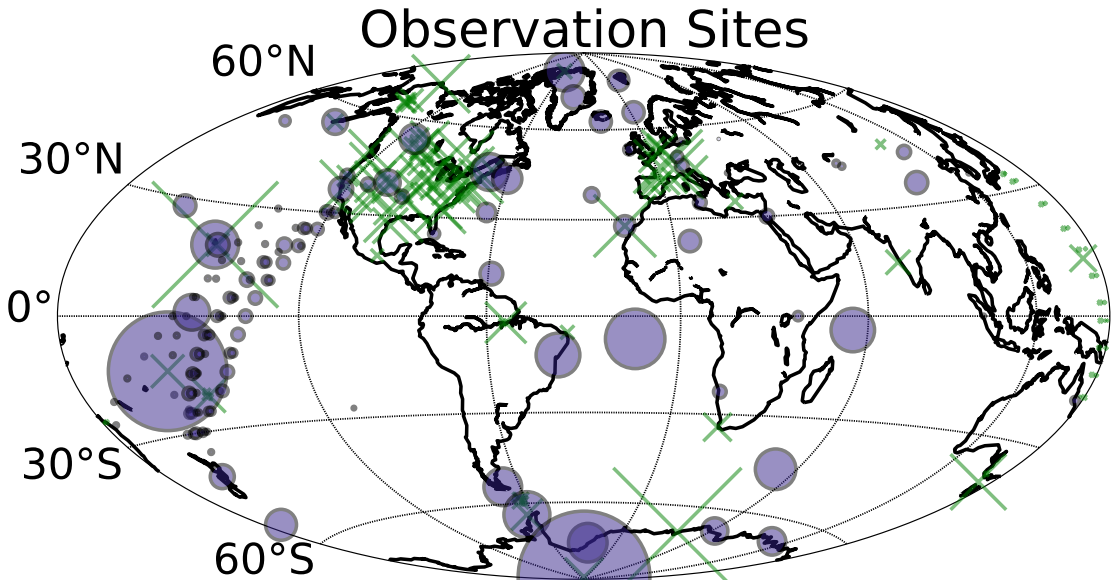

Figure 1: Observation sites assimilated by the baseline run (circles) and non-assimilated validation sites (crosses). The radius of a circle or cross is proportional to $\frac{\sqrt{N}}{\sigma}$ with N the number of available measurements at the site in this location and σ their uncertainty estimate. The larger the symbol, the larger the weight of the site in the model.

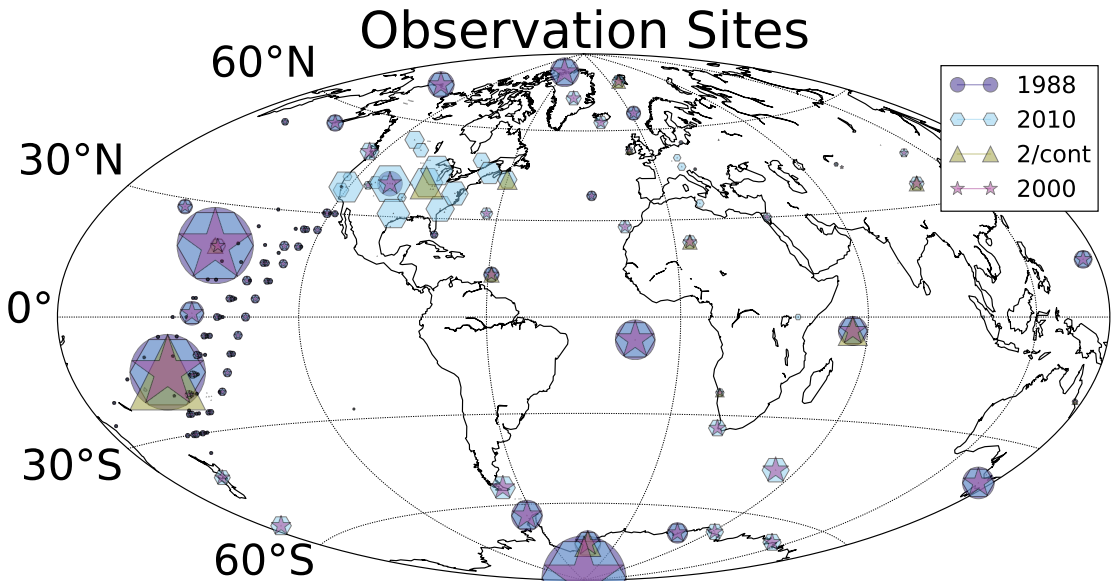

Figure 2: Observation sites assimilated by the '2/cont', '1988', '2000' and '2010' historical runs. The size of the symbol is proportional to $\frac{\sqrt{N}}{\sigma}$ with N the number of available measurements and σ their uncertainty estimate. The larger the symbol, the larger the weight of the site in the model.

Table 1: Observation sites assimilated in the different runs or used in the resampling study, referenced by their NOAA sitecodes. Sites marked with * were removed as not representative of TM5-4DVar-input. Sites not assimilated in the base run are used to validate it. The Site column lists the sitecode, the Meas column gives the measurement type (f: discrete manual flask sampling, c: continuous in situ measurement, p: discrete automated flask sampling), the σ column gives the used representativeness error, the columns base, columns 2/cont, 1988, 2000 and 2010 list whether the site is assimilated in the given model run and the resampling column shows whether the site is used in the resampling study.

Site	Meas	σ [ppm]	base	2/cont	1988	2000	2010	resampling
ABP	f	0.75	yes	-	-	-	yes	-
ALT	c	2.50	yes	-	yes	yes	yes	-
ALT	f	1.50	yes	-	yes	yes	yes	-
AMT	c	3.00	yes	-	-	-	yes	-
AMT	f	3.00	-	-	-	-	-	-
AMT	p	3.00	yes	-	-	-	yes	-
ASC	f	0.75	yes	-	yes	yes	yes	-
ASK	f	1.50	yes	yes	-	yes	yes	-
AZR	f	1.50	yes	-	yes	yes	yes	-
BAL	f	7.50	yes	-	-	yes	yes	-
BAO	c	3.00	*	-	-	-	yes	yes
BAO	p	3.00	*	-	-	-	yes	yes
BGU	f	1.50	-	-	-	-	-	yes
BHD	f	0.75	yes	-	-	yes	yes	-
BKT	f	7.50	yes	-	-	-	yes	-
BME	f	1.50	yes	-	-	yes	yes	-
BMW	f	1.50	yes	-	-	yes	yes	-
BNE	p	2.00	-	-	-	-	-	yes
BRA	c	3.00	-	-	-	-	yes	yes
BRW	f	1.50	-	-	yes	yes	yes	yes
BRW	c	2.50	-	-	yes	yes	yes	yes
BSC	f	7.50	yes	-	-	yes	yes	-
CAR	p	2.00	-	-	-	-	-	yes
CBA	f	1.50	yes	-	yes	yes	yes	-
CDL	c	3.00	-	-	-	-	yes	yes
CFA	f	2.50	yes	yes	-	yes	yes	-
CGO	f	0.75	-	-	yes	yes	yes	yes
CGO	c	2.50	-	-	yes	yes	yes	yes
CHM	c	3.00	-	-	-	-	yes	yes
CHR	f	0.75	yes	-	yes	yes	yes	-
CIB	f	1.50	-	-	-	-	-	yes
CMA	p	2.00	-	-	-	-	-	yes
CPT	f	2.50	-	-	-	-	-	-
CPT	c	2.50	-	-	-	yes	yes	yes
CRI	f	0.75	-	-	-	-	-	yes
CRZ	f	0.75	yes	-	-	-	yes	-

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Table 1 – continued from previous page

Site	Meas	σ [ppm]	base	2/cont	1988	2000	2010	resampling
CYA	f	0.75	yes	-	-	yes	yes	-
DND	p	2.00	-	-	-	-	-	yes
DRP	f	0.75	-	-	-	-	-	yes
EGB	c	3.00	yes	-	-	-	yes	yes
EIC	f	7.50	-	-	-	yes	yes	-
ESP	c	3.00	-	-	-	yes	yes	yes
ESP	p	3.00	-	-	-	-	-	yes
ESP	f	3.00	-	-	-	-	-	-
EST	c	1.50	-	-	-	-	-	yes
ETL	c	3.00	yes	yes	-	-	yes	yes
ETL	p	3.00	-	-	-	-	-	yes
FIK	f	1.50	-	-	-	-	-	yes
FNS	c	1.50	-	-	-	-	-	yes
FSD	c	1.50	-	-	-	-	-	yes
GMI	f	1.50	-	-	yes	yes	yes	yes
HBA	f	0.75	yes	yes	yes	yes	yes	-
HDP	c	3.00	-	-	-	-	yes	yes
HEI	c	1.50	-	-	-	-	-	yes
HIL	p	2.00	-	-	-	-	-	yes
HPB	f	2.50	yes	-	-	-	yes	-
HUN	f	7.50	-	-	-	yes	yes	yes
HUN	c	7.50	-	-	-	-	-	-
ICE	f	1.50	yes	-	-	yes	yes	-
IZO	f	1.50	yes	-	-	yes	yes	-
IZO	c	1.50	-	-	-	-	-	-
JFJ	c	1.50	-	-	-	-	-	yes
KEY	f	2.50	yes	-	yes	yes	yes	-
KUM	f	1.50	yes	-	yes	yes	yes	-
KZD	f	2.50	yes	-	-	yes	yes	-
KZM	f	2.50	yes	-	-	yes	-	-
LEF	c	3.00	-	-	-	-	yes	yes
LEF	f	2.50	-	-	-	-	-	yes
LEF	p	3.00	-	-	-	-	yes[1]	yes
LJO	f	1.50	-	-	-	-	-	yes
LLB	c	3.00	yes	-	-	-	yes	-
LLB	f	3.00	-	-	-	-	-	-
LLN	f	2.50	yes	-	-	-	yes	-
LMP	f	2.50	yes	-	-	-	yes	-
LPO	f	1.50	-	-	-	-	-	yes
LUT	c	1.50	-	-	-	-	-	yes
MAA	f	0.75	yes	-	-	yes	yes	-

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[1] only afternoon samples

Table 1 – continued from previous page

Site	Meas	σ [ppm]	base	2/cont	1988	2000	2010	resampling
MEX	f	2.50	-	-	-	-	-	yes
MHD	f	2.50	yes	yes	-	yes	yes	-
MID	f	1.50	yes	-	yes	yes	yes	-
MKN	f	2.50	yes	-	-	-	yes	-
MLO	f	1.50	yes	yes	yes	yes	yes	-
MLO	c	0.75	-		yes	yes	yes	-
MQA	f	0.75	yes	-	-	yes	yes	-
NHA	p	2.00	-	-	-	-	-	yes
NMB	f	2.50	yes	yes	-	yes	yes	-
NWR	f	1.50	-	-	yes	yes	yes	yes
NWR	p	1.50	-	-	yes	yes	yes	yes
NWR	c	1.50	-	-	yes	yes	yes	yes
OBN	f	7.50	yes	yes	-	-	-	-
ORL	p	1.50	-	-	-	-	-	-
ORL	f	1.50	-	-	-	-	-	-
OTA	f	2.50	-	-	-	-	-	yes
OXK	f	2.50	yes	-	-	-	yes	-
PAL	f	2.50	yes	-	-	yes	yes	-
PAL	c	2.50	-	-	-	-	-	-
PDM	f	1.50	-	-	-	-	-	yes
PFA	p	2.00	-	-	-	-	-	yes
POC	f	0.75	yes	-	yes	yes	yes	-
PSA	f	0.75	yes	-	yes	yes	yes	-
PTA	f	7.50	yes	-	-	yes	yes	-
RBA	c	1.50	-	-	-	-	-	yes
RPB	f	1.50	yes	yes	yes	yes	yes	-
RTA	p	2.00	-	-	-	-	-	yes
SBL	c	3.00	yes	-	-	-	-	-
SAN	f	2.00	-	-	-	-	-	yes
SAN	p	2.00	-	-	-	-	-	yes
SCA	p	2.00	-	-	-	-	-	yes
SCT	c	3.00	*	-	-	-	yes	yes
SCT	p	3.00	*	-	-	-	-	yes
SEY	f	0.75	yes	yes	yes	yes	yes	-
SGP	f	2.50	yes	-	-	-	yes	-
SGP	c	3.00	yes	-	-	-	yes	-
SGP	p	2.50	-	-	-	-	-	-
SHM	f	2.50	yes	-	yes	yes	yes	-
SMO	f	1.50	yes	yes	yes	yes	yes	-
SMO	c	0.75	yes	yes	yes	yes	yes	-
SNP	c	3.00	-	-	-	-	yes	yes
SPL	c	3.00	yes	-	-	-	yes	-
SPO	f	1.50	yes	-	yes	yes	yes	-

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Table 1 – continued from previous page

Site	Meas	σ [ppm]	base	2/cont	1988	2000	2010	resampling
SPO	c	0.75	yes	-	yes	yes	yes	-
STM	f	1.50	yes	-	yes	yes	yes	-
STR	p	3.00	yes	-	-	-	yes	-
SUM	f	1.50	yes	-	-	yes	yes	-
SYO	f	0.75	-	-	yes	yes	yes	yes
SYO	c	0.75	-	-	-	-	-	yes
TAP	f	7.50	yes	-	-	yes	yes	-
TDF	f	0.75	yes	-	-	yes	yes	-
TGC	p	2.00	-	-	-	-	-	yes
THD	f	2.50	yes	-	-	-	yes	-
THD	p	2.50	-	-	-	-	-	-
TOT	c	1.50	-	-	-	-	-	yes
TRN	c	1.50	-	-	-	-	-	yes
UTA	f	2.50	yes	-	-	yes	yes	-
UUM	f	2.50	yes	-	-	yes	yes	-
WBI	c	3.00	*	yes	-	-	yes	yes
WBI	p	3.00	*	yes	-	-	yes	yes
WGC	c	3.00	*	-	-	-	yes	yes
WGC	p	3.00	*	-	-	-	yes	yes
WIS	f	2.50	yes	-	-	yes	yes	-
WKT	c	3.00	*	-	-	-	yes	yes
WKT	p	3.00	*	-	-	-	yes	yes
WKT	f	2.50	*	-	-	-	-	yes
WLG	f	1.50	yes	yes	-	yes	yes	-
WPC	f	1.50	-	-	-	-	-	-
WSA	c	3.00	yes	yes	-	-	yes	-
ZEP	f	1.50	yes	yes	-	yes	yes	-

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