



Inversion multi-contraintes et multi-espèces

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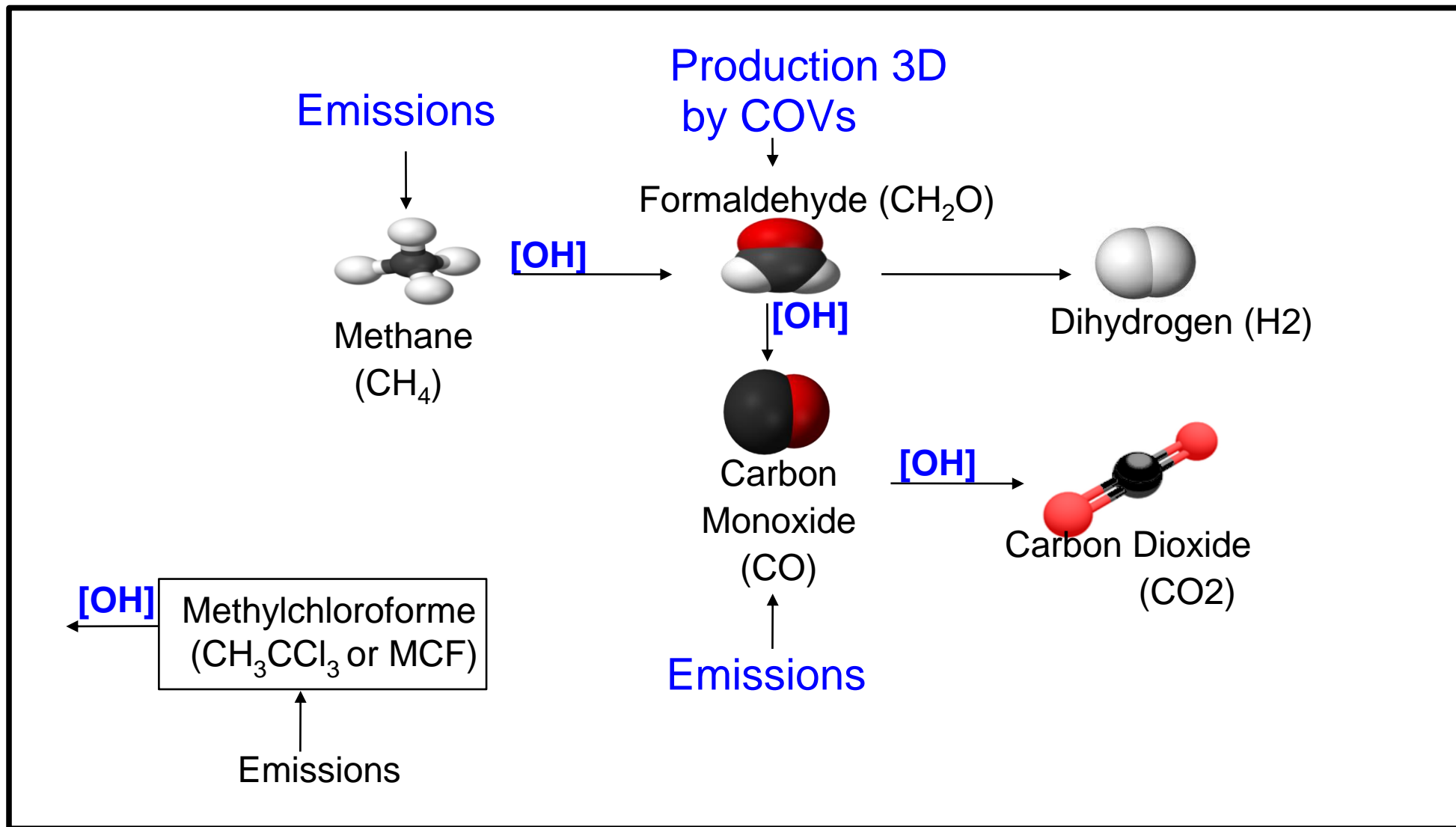
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Modèle Chimie-transport :LMDz-SACS

- Version 4 (*Hourdin et al., 2006*) - Résolution standard : $3,75^\circ \times 2,5^\circ$
- 19 niveaux verticaux - Version off-line - Vents ECMWF

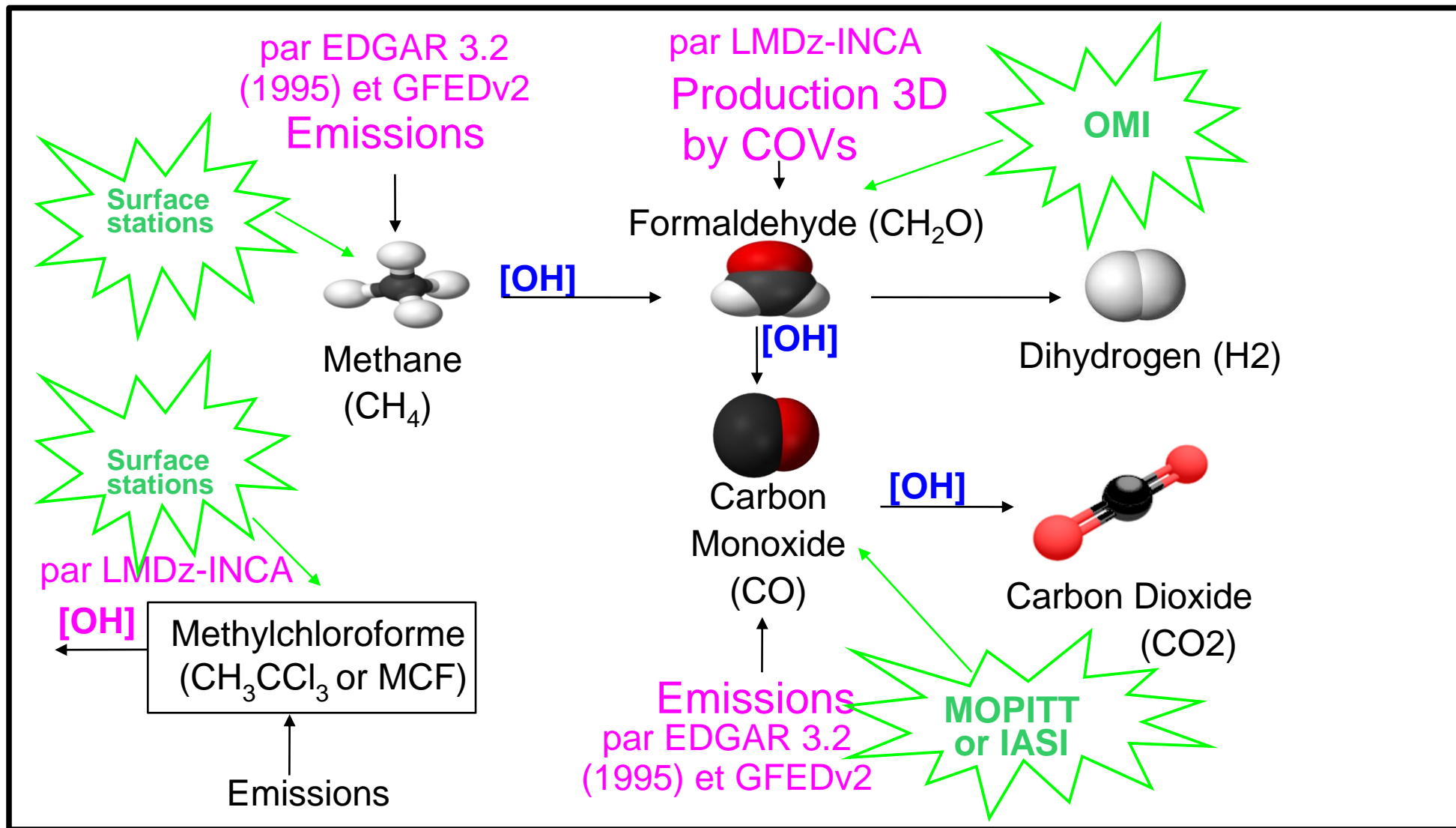


Variables optimisées

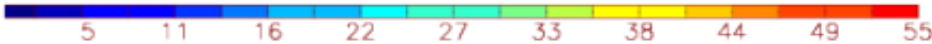
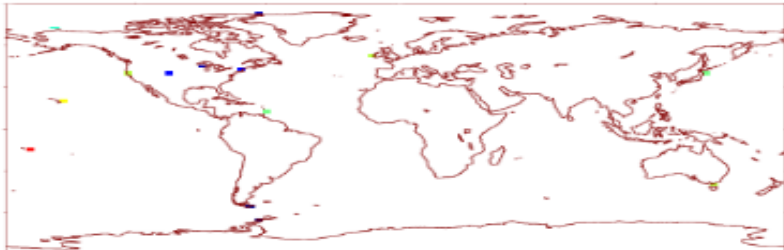
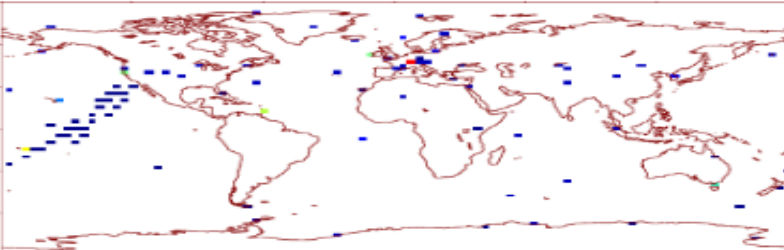
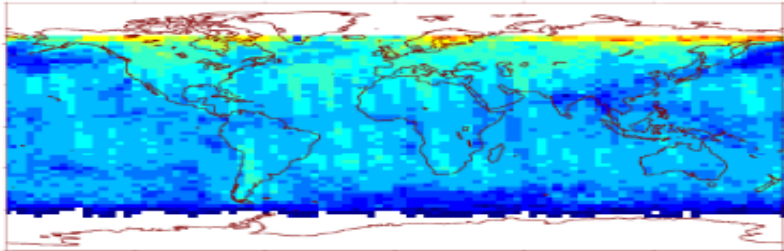
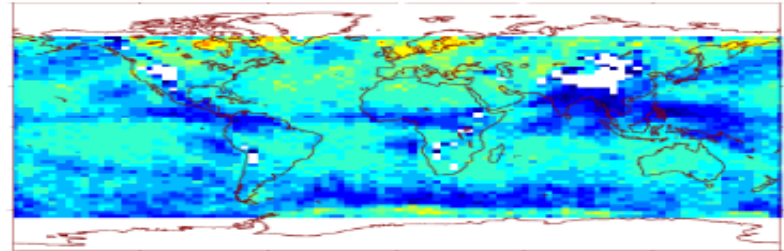
(Hauglustaine et al., 2004, Folberth et al.; 2006, Pison et al.; 2009)

Modèle Chimie-transport :LMDz-SACS

Les informations a priori et les observations



(Hauglustaine et al., 2004, Folberth et al.; 2006, Pison et al.; 2009)

Species	Types	Total number of observations	Number of observations per pixel and per month (July 2006) 
MCF	Surface stations	10,487	
CH ₄	Surface stations	201,174	
HCHO	OMI	4,443,425	
CO	MOPITT	4,759,828	

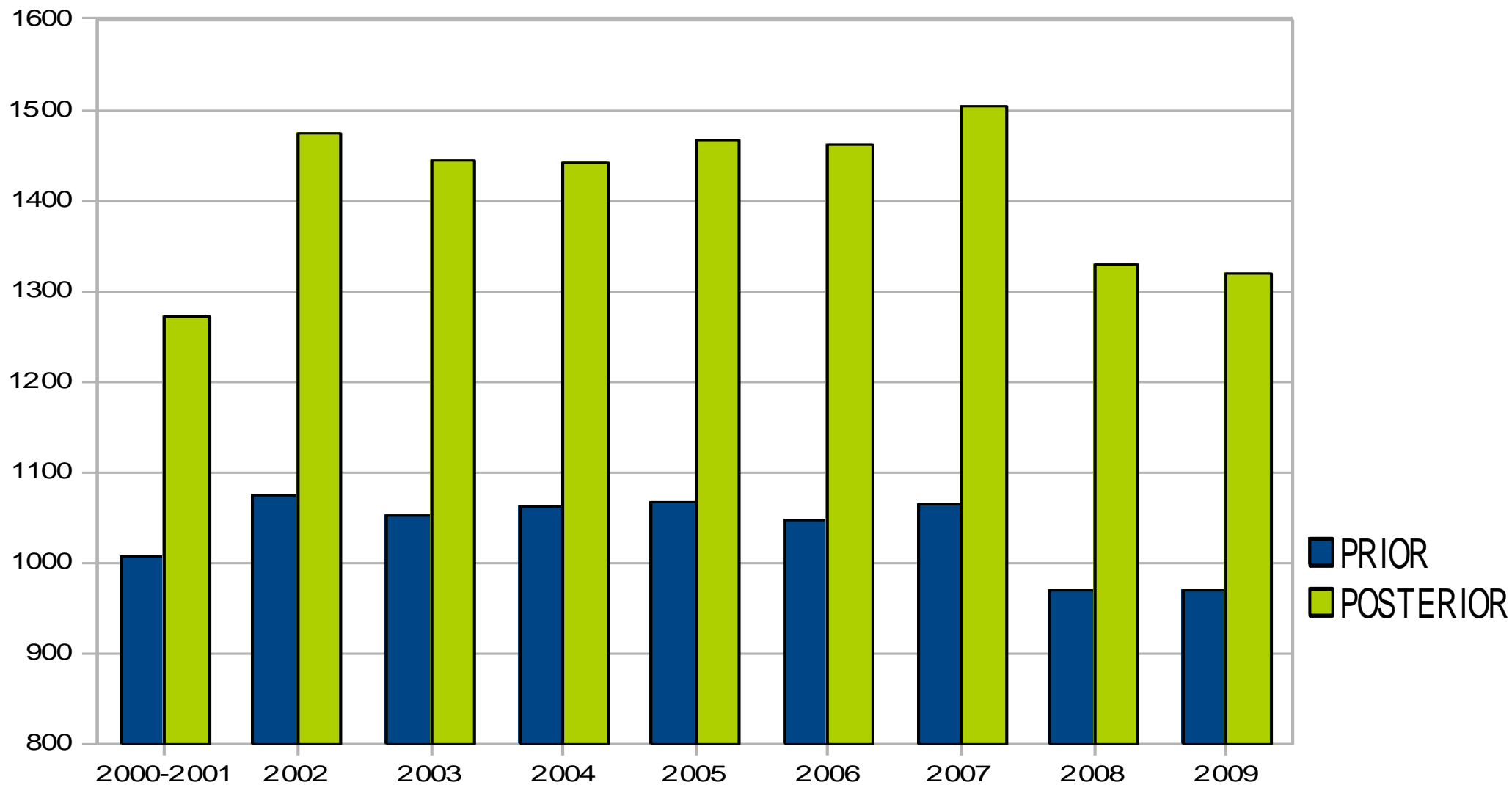
2005-2008 ~ 10 Millions de mesures

Resultats

1. Les inventaires a priori sous-estiment les émissions de CO

Emissions a priori mondiales = 1038 Tg/an (moyenne sur les 10ans)

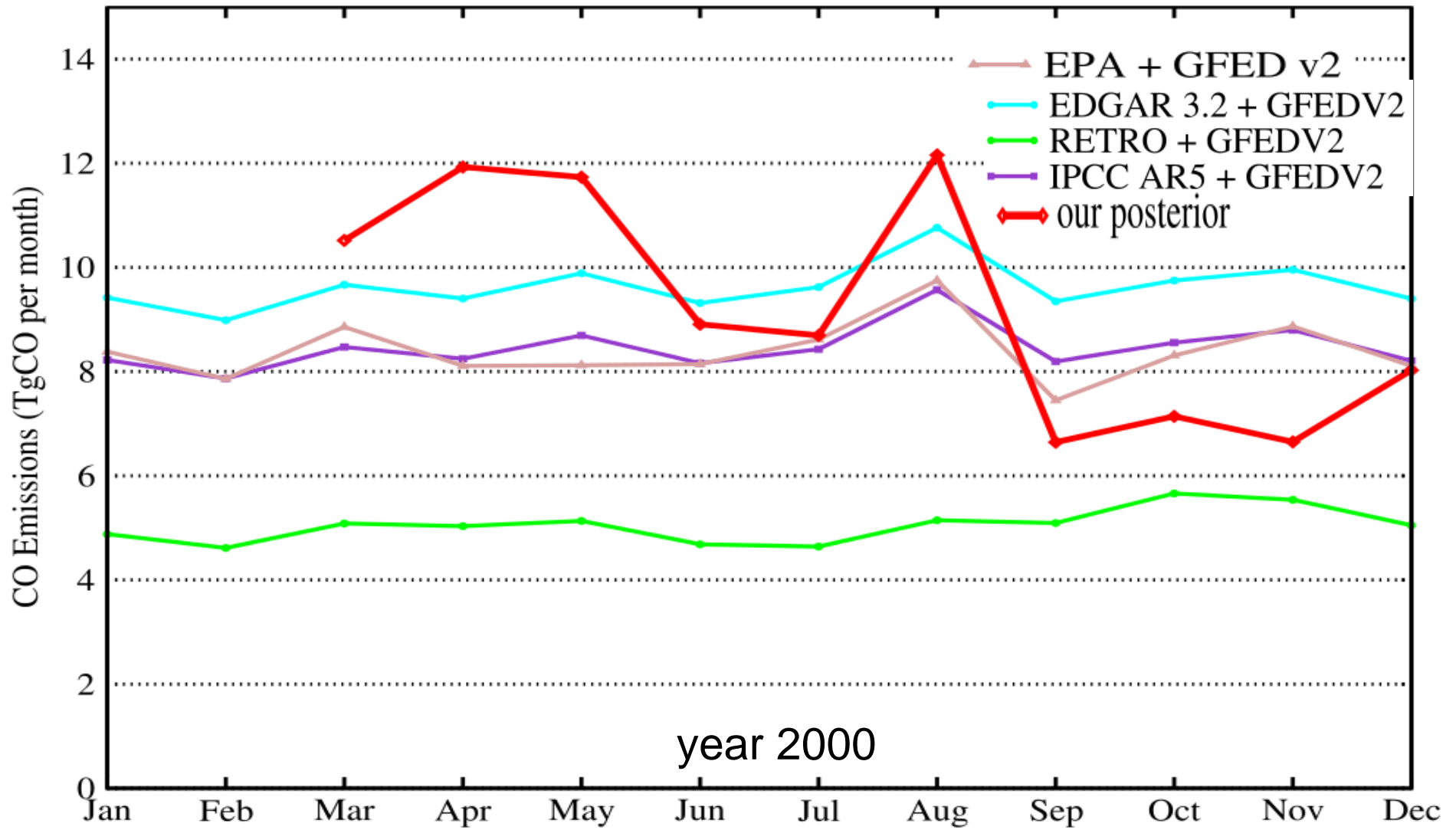
⇒ Les émissions a posteriori sont 37% supérieures aux émissions a priori (~1430 TgCO/an)



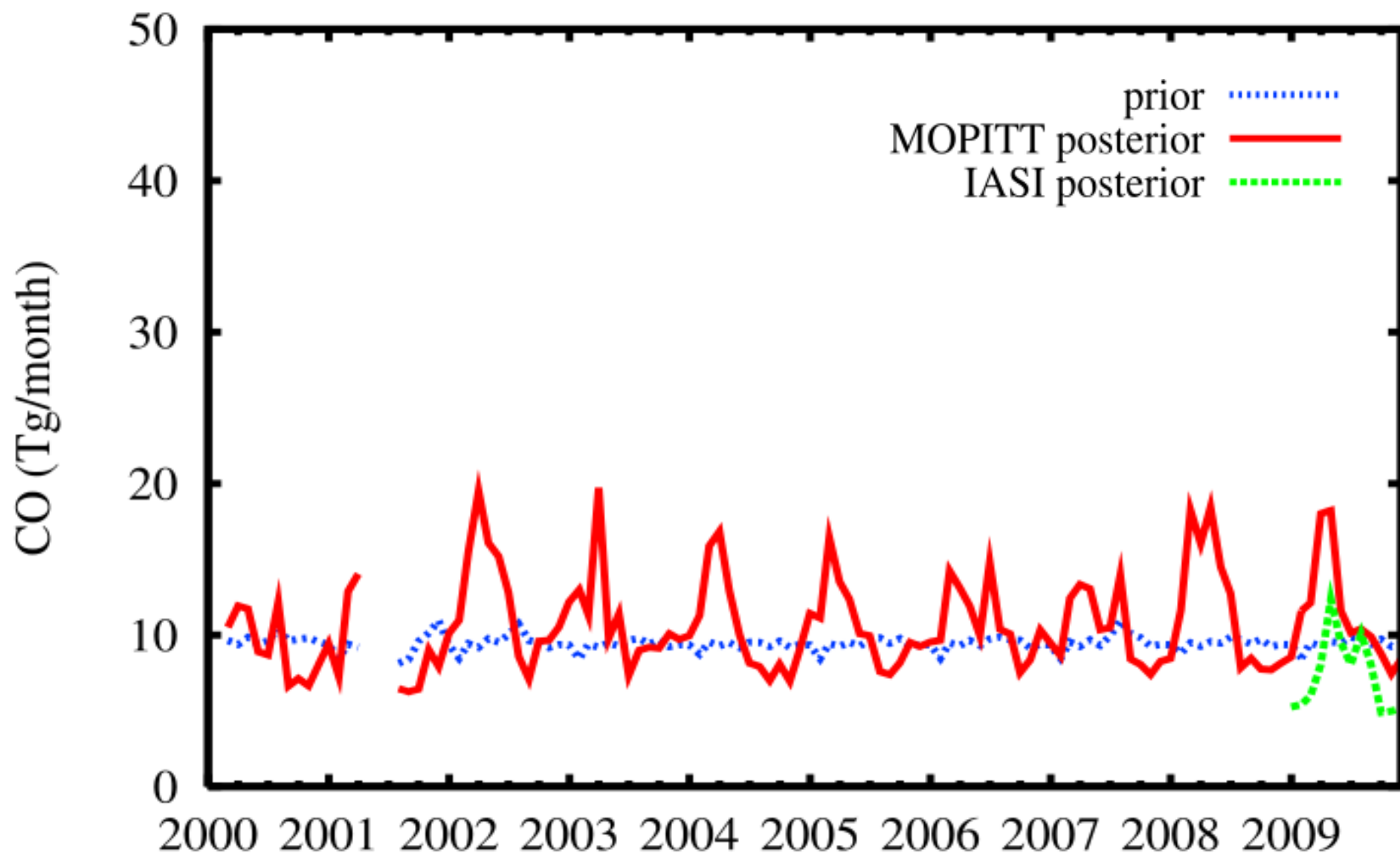
Evolution of annual CO emissions between 2000 and 2009, in TgCO/yr

2. Variations saisonnières dans l'hémisphère Nord

(aussi montré par Kopacz et al., 2010)



USA



3. Émissions régionales de CO en TgCO/yr: synthèse pour 2005

	USA	China	Canada	Western Europe	Global
EDGAR3.2+ GFED2 (our prior)	105	108	8	44	1066
Posterior MOPITT+mcf	112	213	49	52	1467
Posterior MOPITT+OMI +mcf +ch4	132	151	54	58	1401
EDGAR 4.2+GFED3	60	96	12	22	1284



TransCom model simulations of CH₄ and related species: linking transport, surface flux and chemical loss with CH₄ variability in the troposphere and lower stratosphere

P. K. Patra, S. Houweling, M. Krol, P. Bousquet, D. Belikov, D. Bergmann, H. Bian, P. Cameron-Smith, M. P. Chipperfield, K. Corbin, A. Fortems-Cheiney, A. Fraser, E. Gloor, P. Hess, A. Ito, S. R. Kawa, R. M. Law, Z. Loh, S. Maksyutov, L. Meng, P. I. Palmer, R. G. Prinn, M. Rigby, R. Saito, and C. Wilson

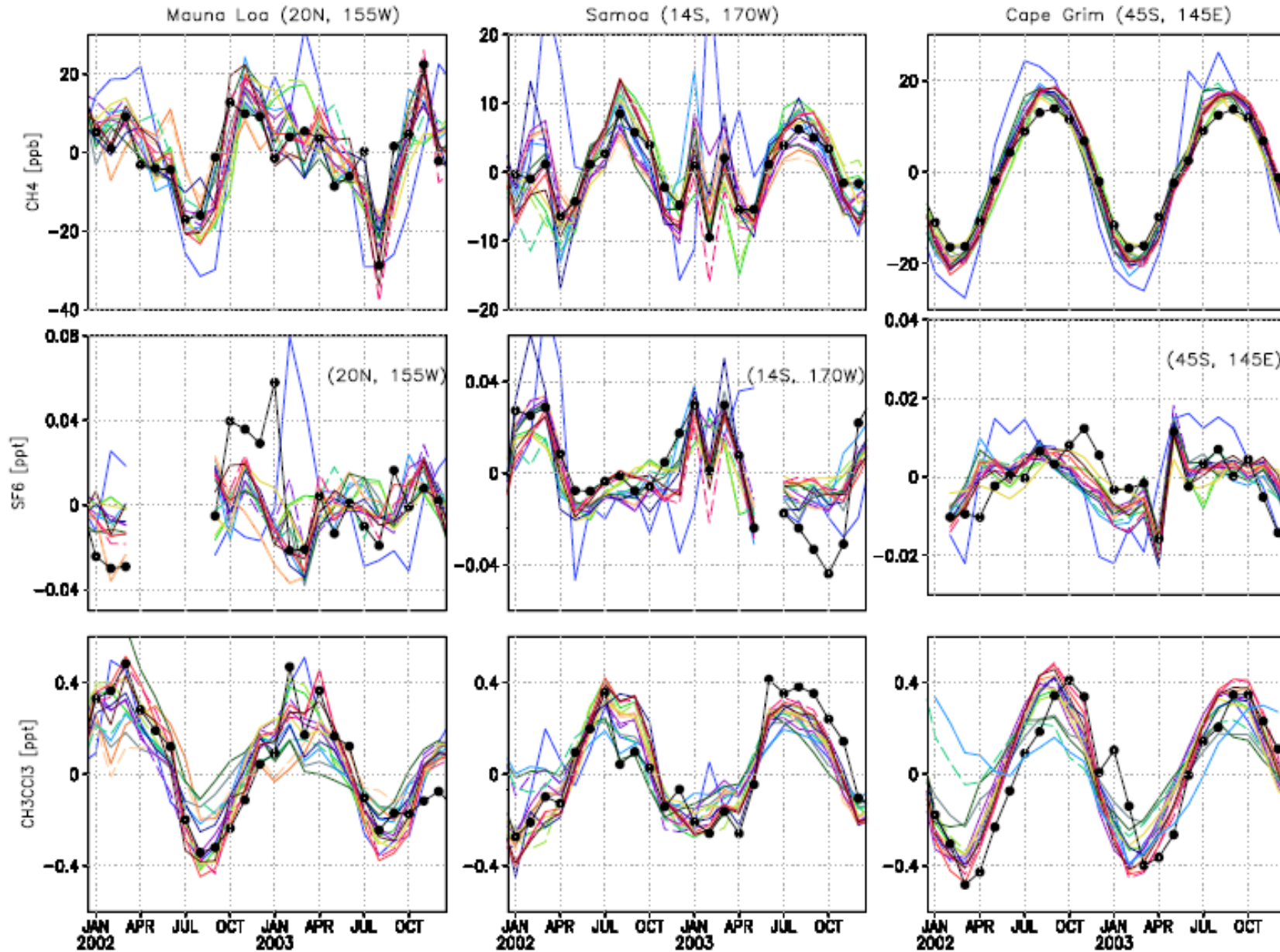


Comparaison de 12 modèles pour des simulations directes de CH₄, SF₆ et MCF

Sl. No.	Model name ^a	Institution ^b	Resolution		Meteorology ^e	Avg. lifetime (1992–07) ^f	
			Horizontal ^c	Vertical ^d		CH ₄ -CTL	CH ₃ CCl ₃
1	ACCESS	CSIRO	3.75 × 2.5°	38	AGCM; SST	9.93 ± 0.13	4.55 ± 0.15
2	ACTM	RIGC	~2.8 × 2.8°	67σ	NCEP2; U, V, T; SST	10.0 ± 0.10	4.60 ± 0.13
2a	ACTM.OH [§]	RIGC	~2.8 × 2.8°	67σ	NCEP2; U, V, T; SST	9.51 ± 0.10	4.84 ± 0.13
3	CAM	CU	2.5 × ~1.9°	28σ	NCEP/NCAR	10.2 ± 0.11	3.77 ± 0.13
4	CCAM	CSIRO	~220 km	18σ	NCEP; U, V; SST	9.94 ± 0.27	4.01 ± 0.15
5	GEOS-Chem	UoE	2.5 × 2.0°	30/47η	NASA/GSFC/GEOS4/5	9.60 ± 0.11	4.70 ± 0.13
5a	GEOS-Chem.DOH	UoE	2.5 × 2.0°	30/47η	NASA/GSFC/GEOS4/5	9.95 ± 0.11	4.84 ± 0.13
6	IMPACT	LLNL	5.0 × 4.0°	55η	NASA/GSFC/GEOS4	10.1 ± 0.05	4.63 ± 0.3
6a	IMPACT_1 × 1.25	LLNL	1.25 × 1.0°	55η	NASA/GSFC/GEOS4	9.99 ± 0.07	4.54 ± 0.16
7	LMDZ	LSCE	3.75 × 2.5°	19η	ECMWF; U, V, T; SST	10.0 ± 0.09	3.90 ± 0.25
8	MOZART	MIT	~1.8 × 1.8°	28σ	NCEP/NCAR	9.88 ± 0.15	3.90 ± 0.15
9	NIES08i	NIES	2.5 × 2.5°	32σ-θ	JCDAS, ERA-interim-PBL	10.0 ± 0.06	4.75 ± 0.02
10	PCTM	GSFC	1.25 × 1.0°	58η	NASA/GSFC/GEOS5	10.1 ± 0.1	4.54 ± 0.21
11	TM5	SRON	6.0 × 4.0°	25η	ECMWF, ERA-interim	10.1 ± 0.12	4.87 ± 0.03
11a	TM5_1 × 1	SRON	1.0 × 1.0°	25η	ECMWF, ERA-interim	10.1 ± 0.11	4.88 ± 0.14
12	TOMCAT	UoL	~2.8 × 2.8°	60η	ECMWF, ERA-40/interim	9.98 ± 0.12	4.71 ± 0.18

Comparisons entre concentrations simulées et observées

Measured	ACTM_OH	GEOS-Chem	IMPACT	NIES-08	TM5_1x1
ACCESS	CAM	GEOS-Chem_DOH	LMDZ	PCTM	TOMCAT
ACTM	CCAM	IMPACT_1x1.25	MOZART	TM5	



Merci de votre attention.