ISBA-MEB-L

ISBA multi source (MEB)
& litière explicite

Évaluation au sein des forêts

Adrien Napoly (CNRM-GAME)

Aaron Boone (CNRM-GAME), Patrick Samuelsson (SMHI)

18/01/16
AMA

PLAN

Présentation du modèle

Evaluation à l'échelle locale (France)

Benchmark (sites Fluxnet)

Conclusion

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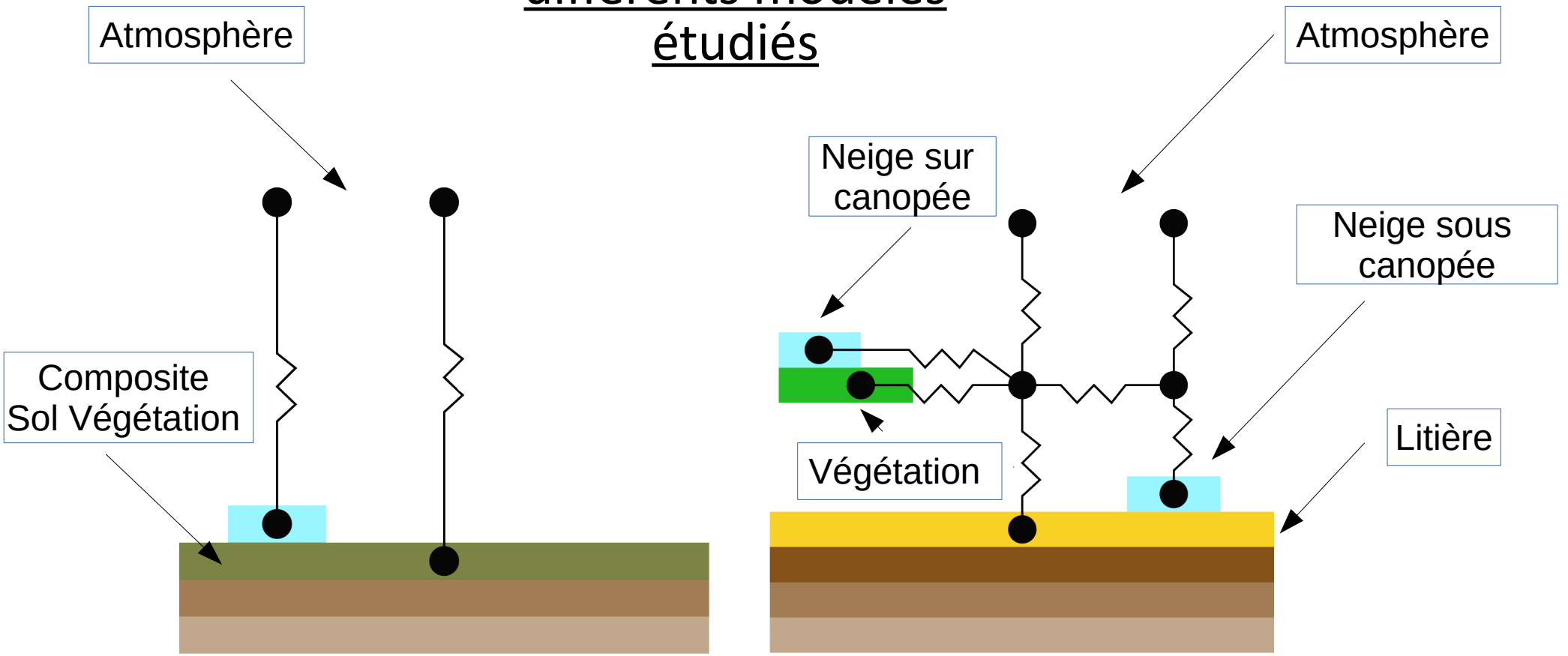
Schéma des différents modèles étudiés



ISBA Standard
Couplage direct avec atmosphère

ISBA-MEB-L
Couplage indirect avec atmosphère

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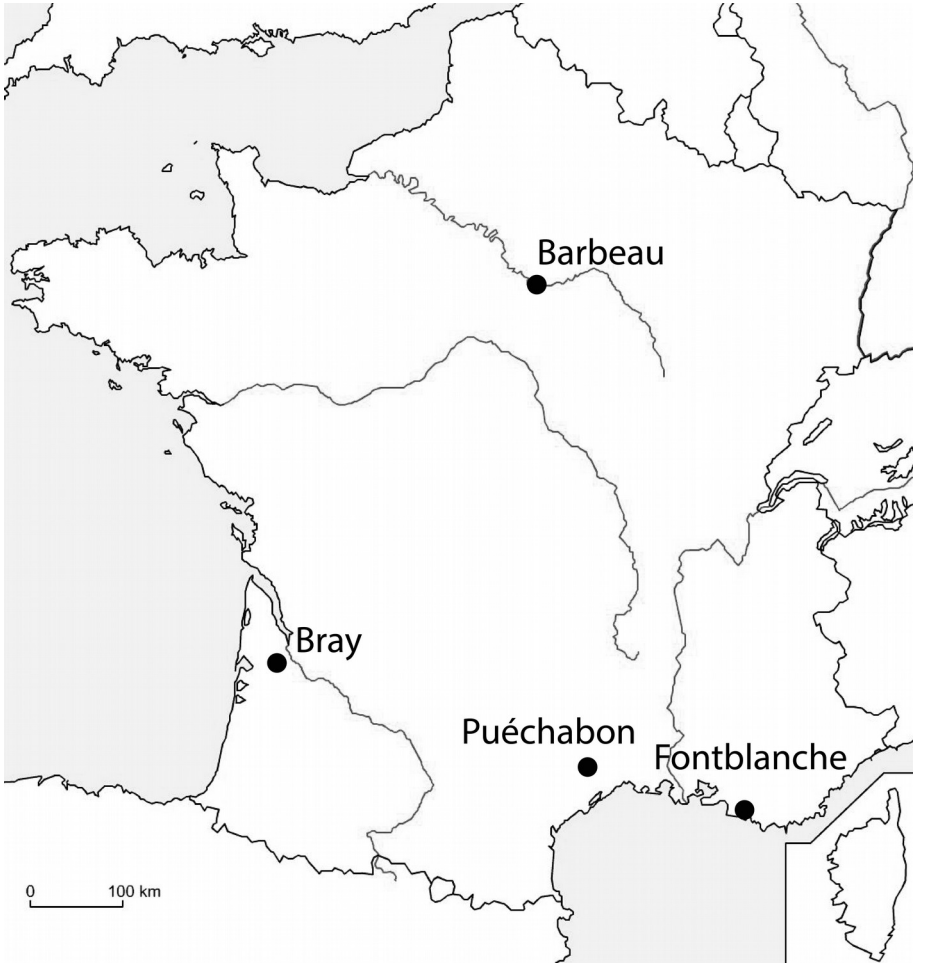
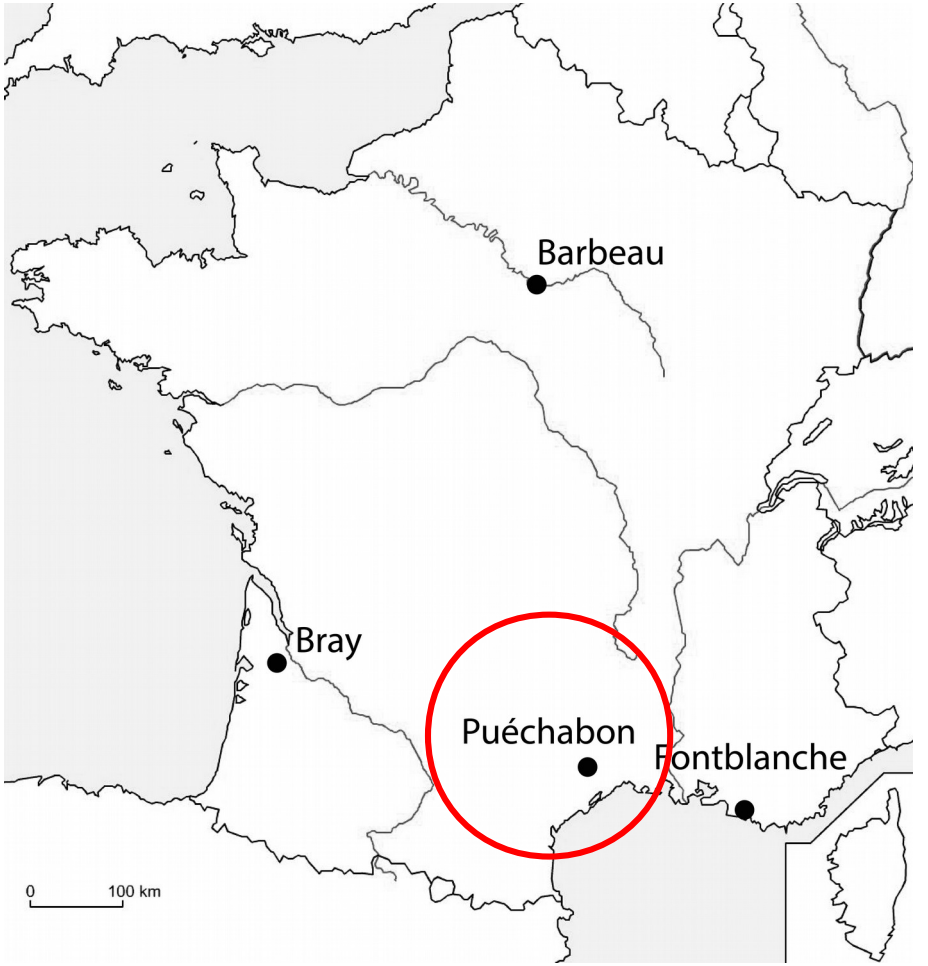
Validation sur sites locaux



Site	Barbeau	Puéchabon	Fontblanche	Bray
Végétation	Chênes sessiles et charmes	Chêne vert (90%) / Chêne pubescent	Pin d'Alep / Chêne vert et Kermes	Pin maritime / molinie
PI / Contact	E. Dufrene	S. Rambal	G.Simioni	J. Ogée

Validation sur sites locaux



Site	Barbeau	Puéchabon	Fontblanche	Bray
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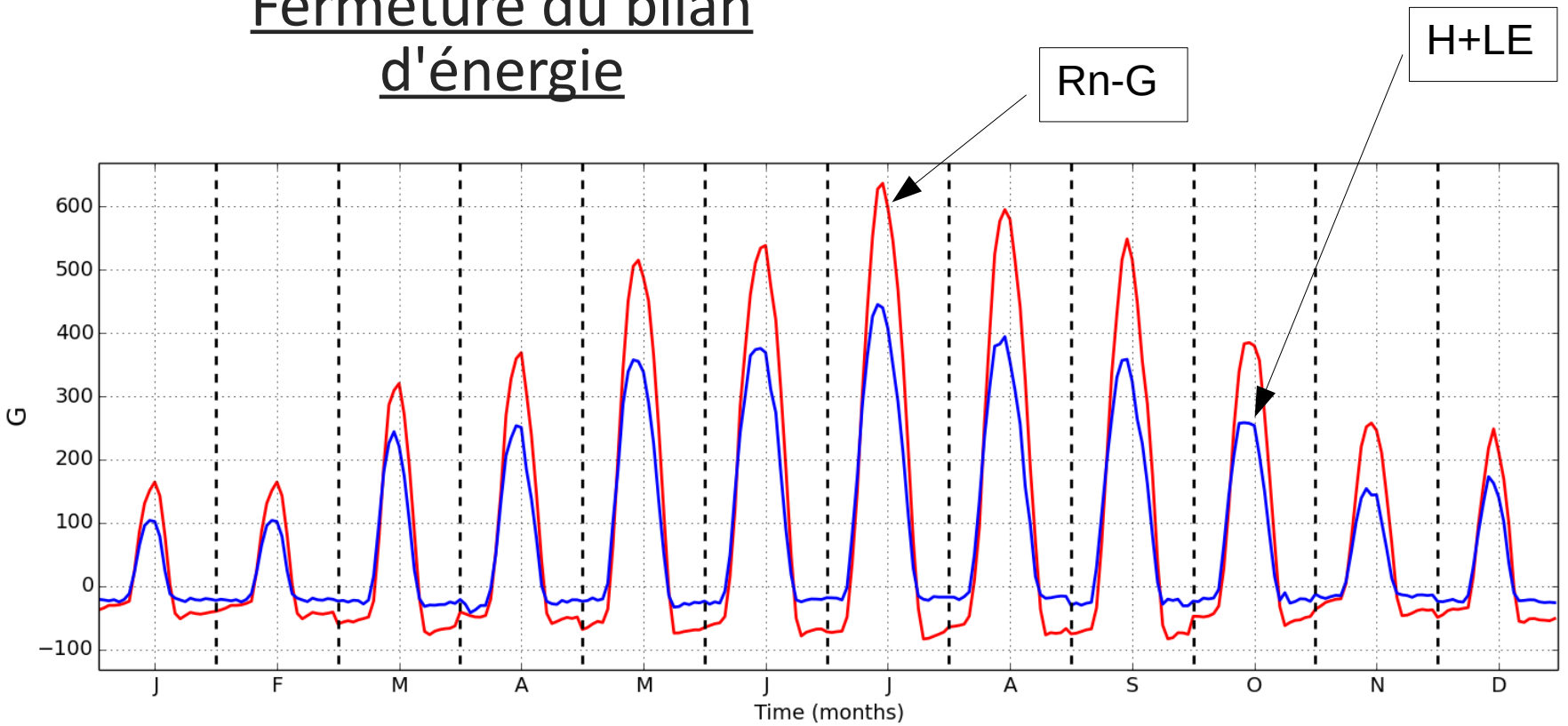
Fermeture du bilan d'énergie



Correction avec méthode du Bowen Ratio :

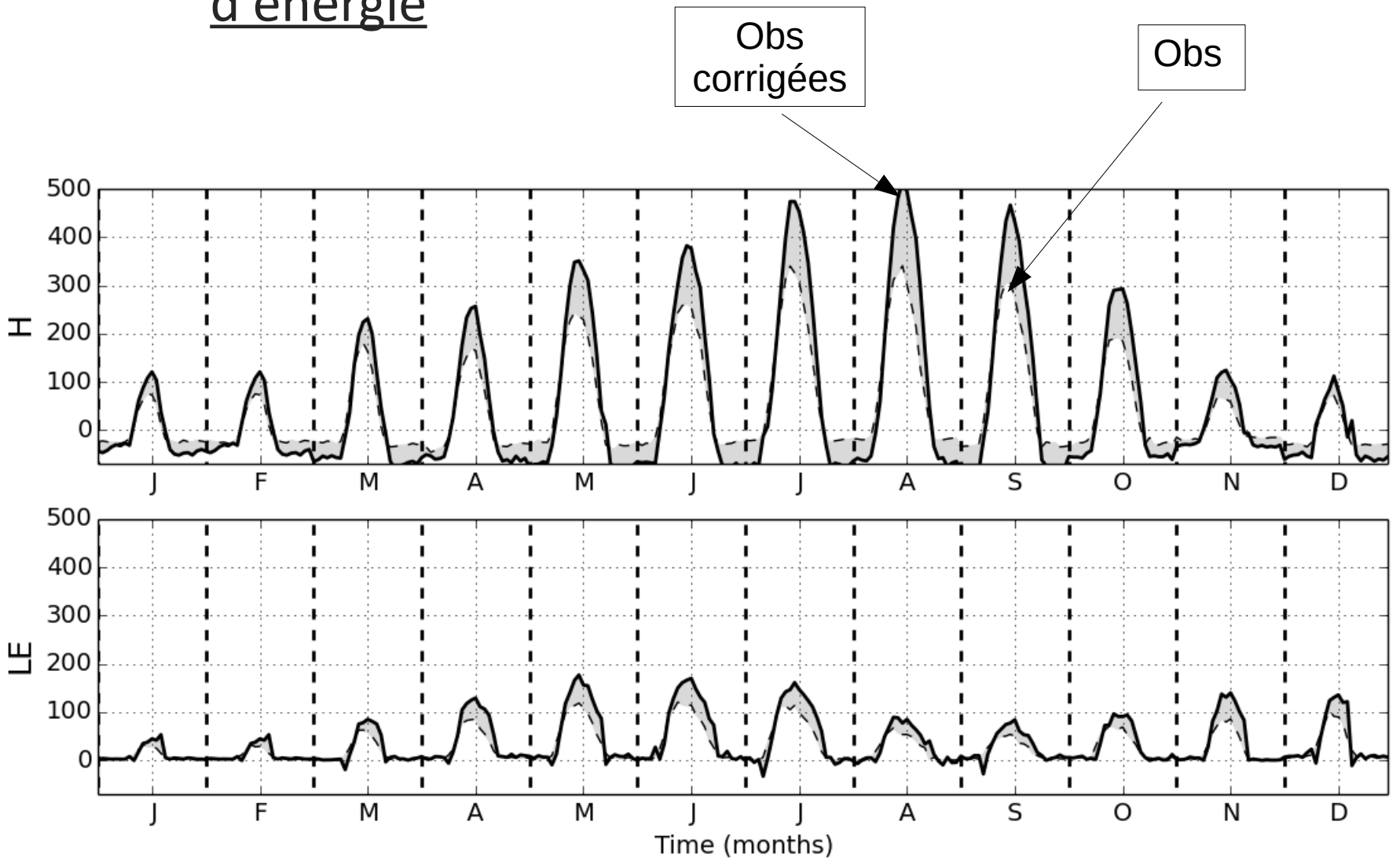
- Rn et G bon
- S négligeable
- Bo=H/LE bon

$$res = R_n - G - S - H - LE$$

$$H_{cor} = H + res\frac{H}{H+LE} \qquad LE_{cor} = H + res\frac{LE}{H+LE}$$

Site	Fermeture
Puéchabon	82 %
Fontblanche	93 %
Le Bray	87 %
Barbeau	80 %

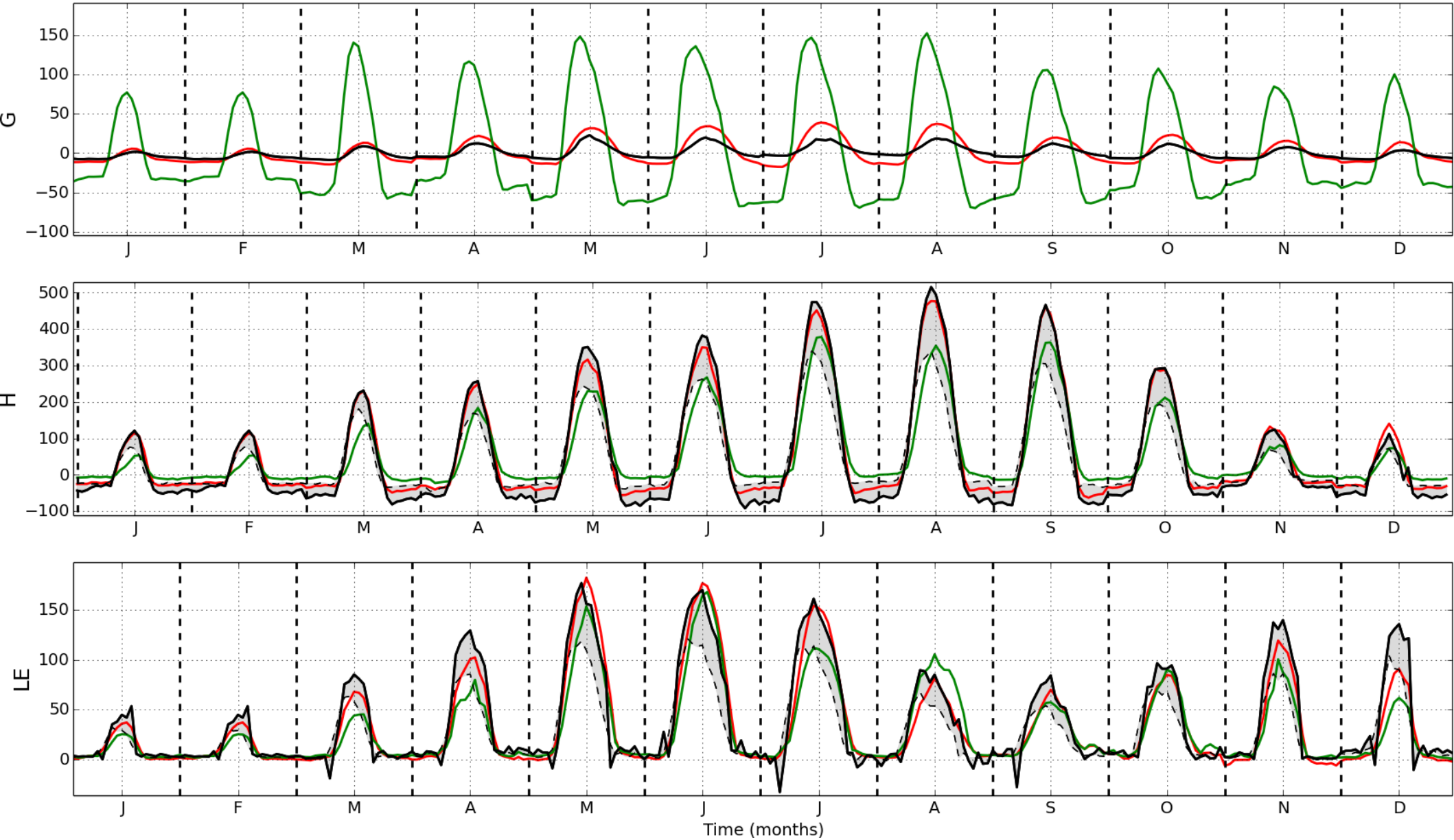
Fermeture du bilan d'énergie



Résultats local

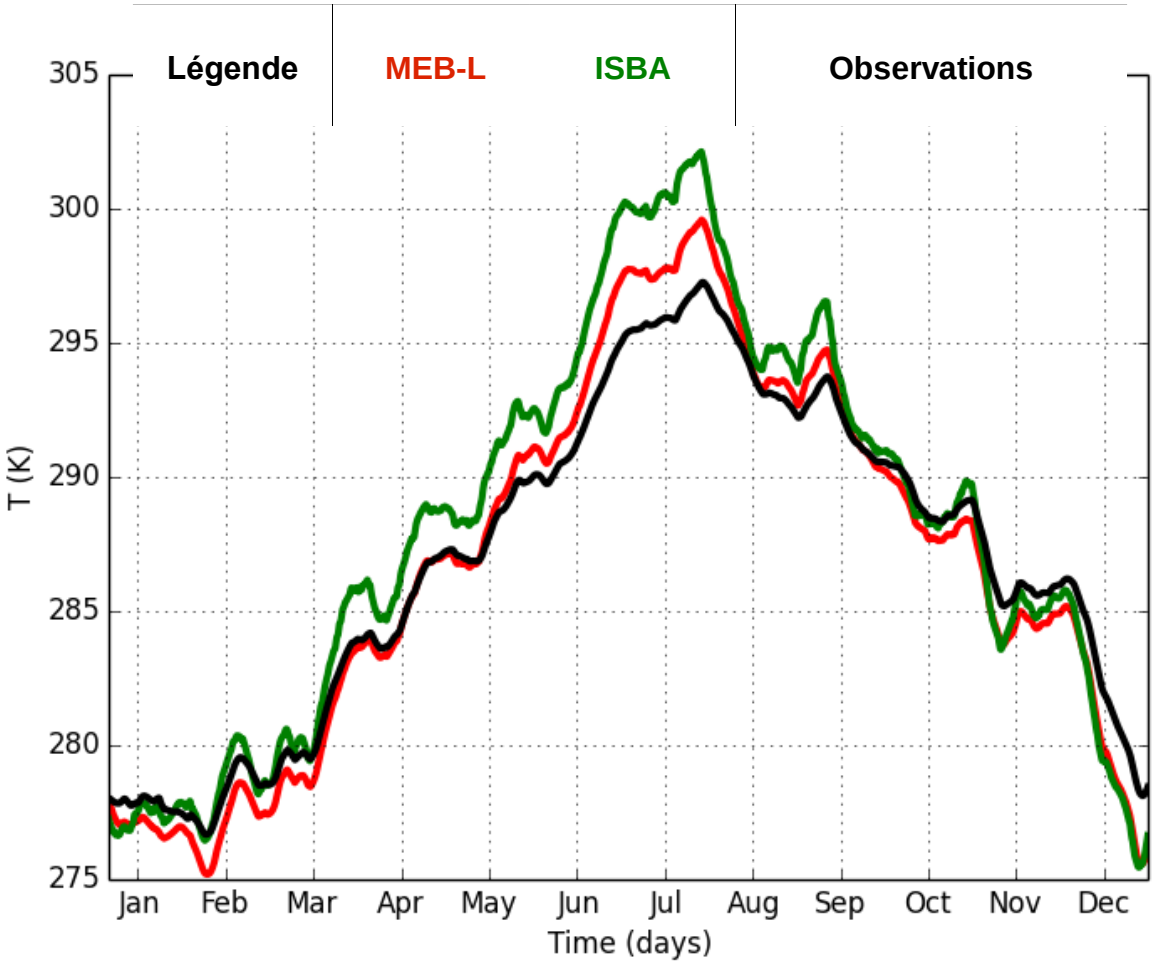
Site Puéchabon - 2006

Légende	MEB-L	ISBA	Observations



Résultats local

Site Puéchabon - 2006



Température 10 cm, Moyenne glissante

Site	MEB-L	ISBA
Puéchabon	3,2	4,4
Fontblanche	1,1	2,7
Le Bray	2,2	3,7
Barbeau	1,2	3,4

RMSE (K) par Site

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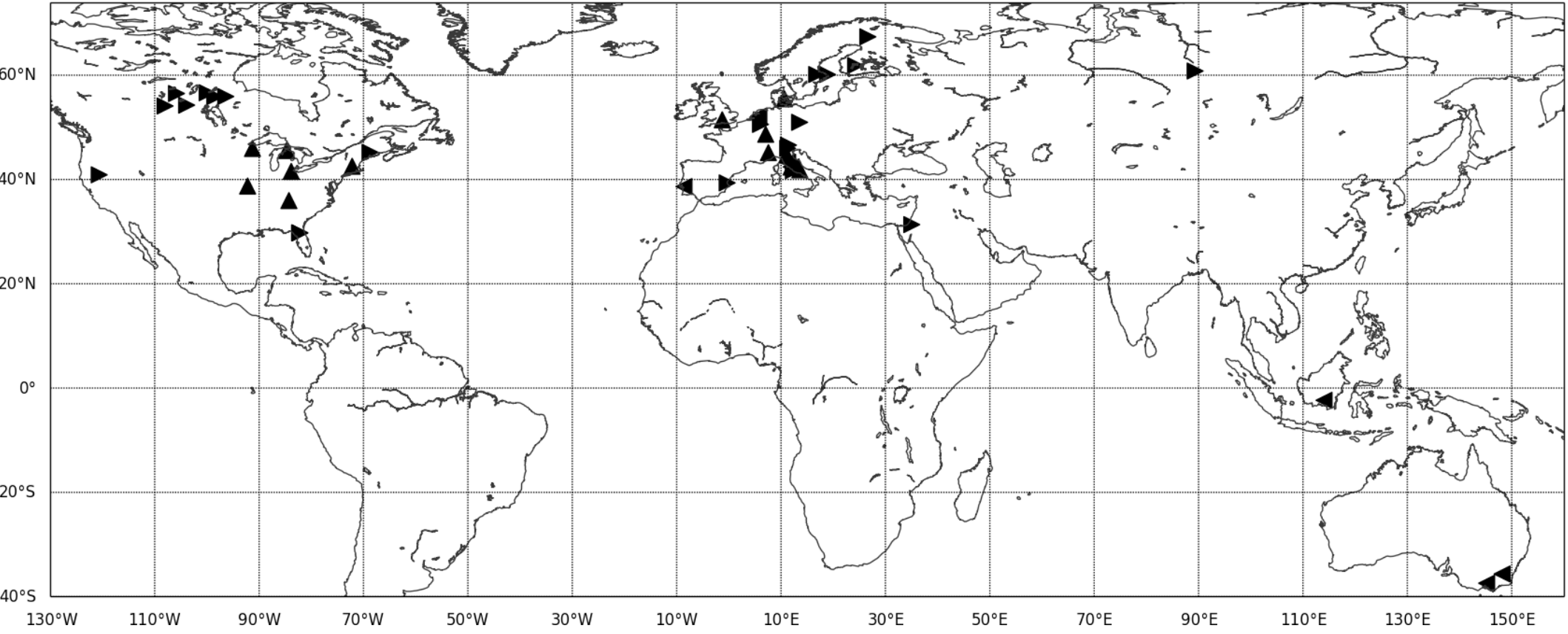
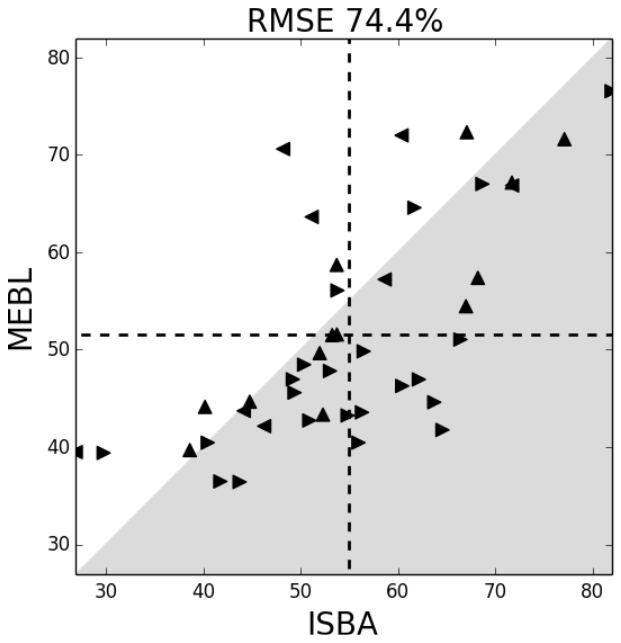
Résultats Benchmark Sites Fluxnet

- Fermeture : Critère de fermeture énergétique à 80 % (40 sites et 153 années)
- Base de données :
  - Ecoclimap (textures, LAI)
  - HWSD (SOC)
  - papiers, sites internet (Hauteur, PFT)
- Évaluation sur flux turbulent



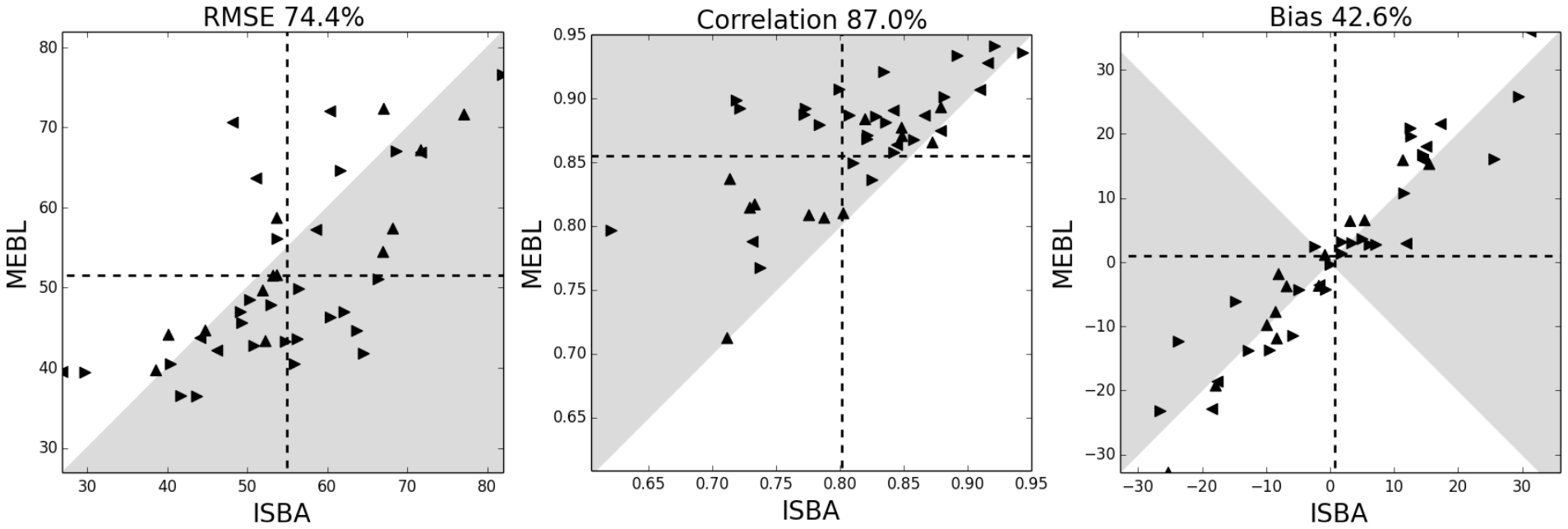
Résultats sur tous sites et années, pas de temps semi horaire

H



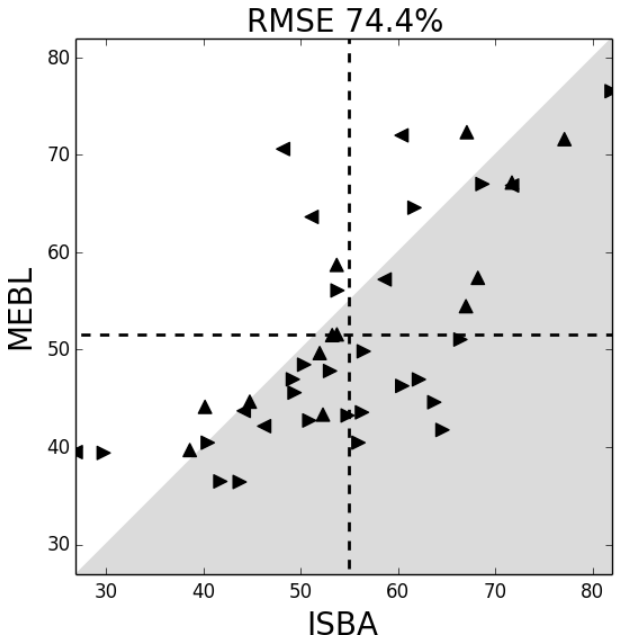
Résultats sur tous sites et années, pas de temps semi horaire

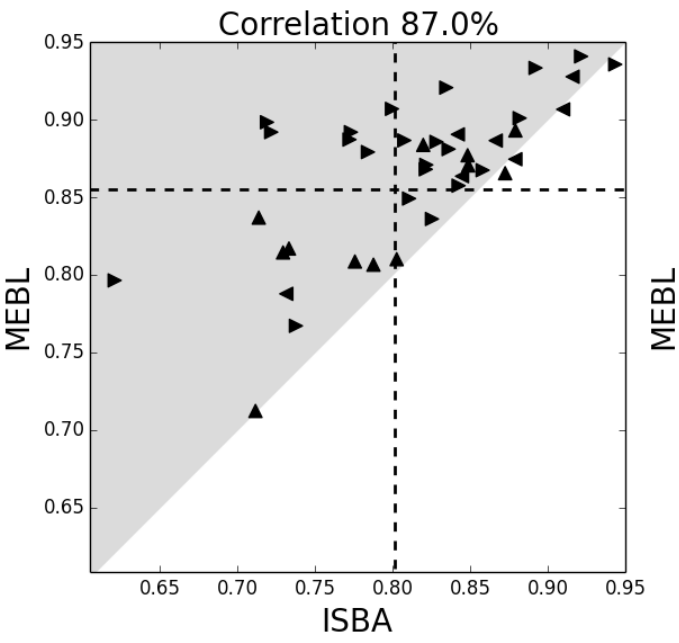
H

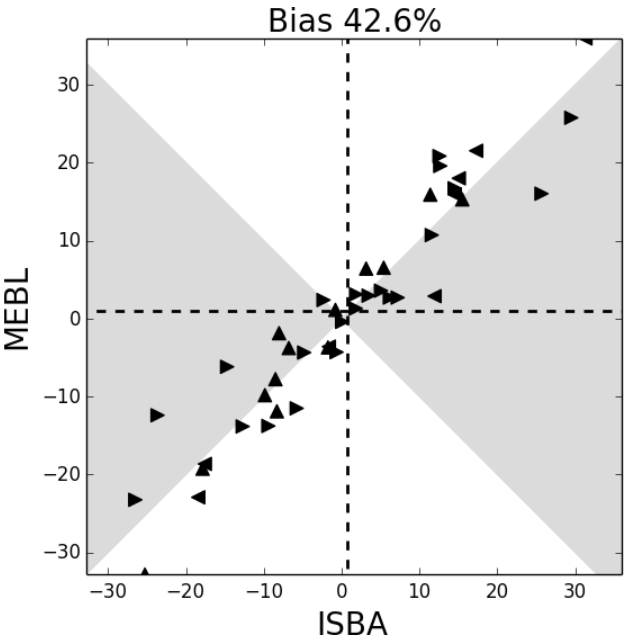


Résultats sur tous sites et années, pas de temps semi horaire

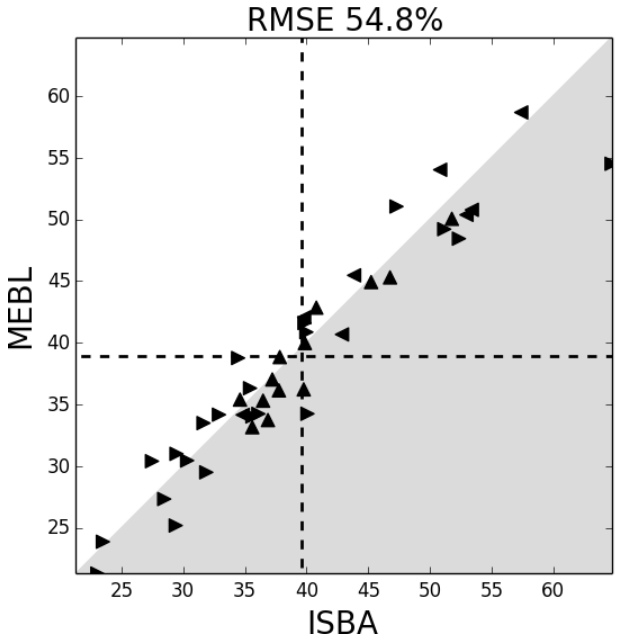
H

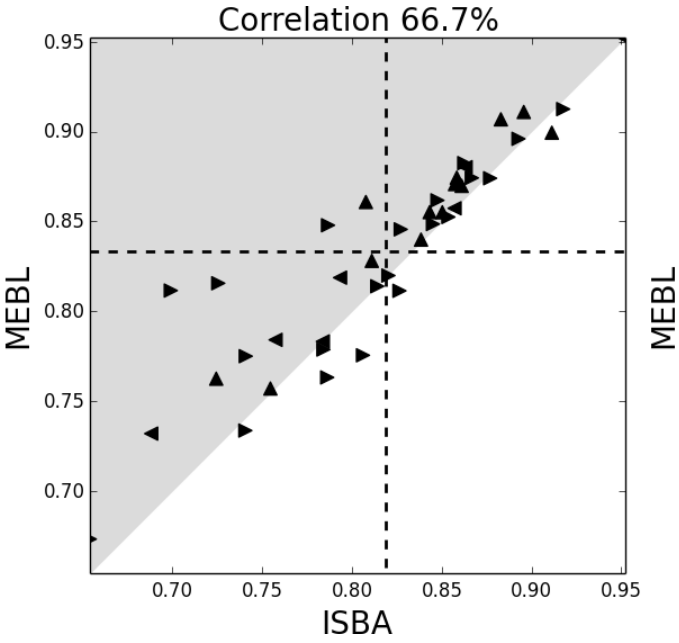


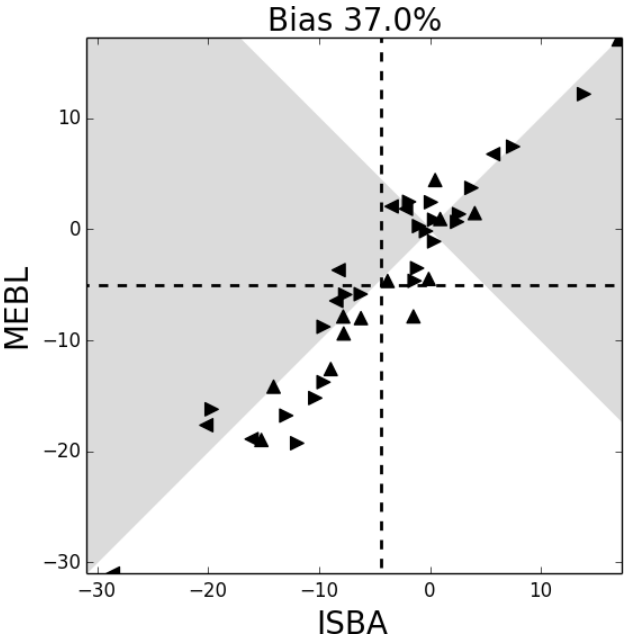




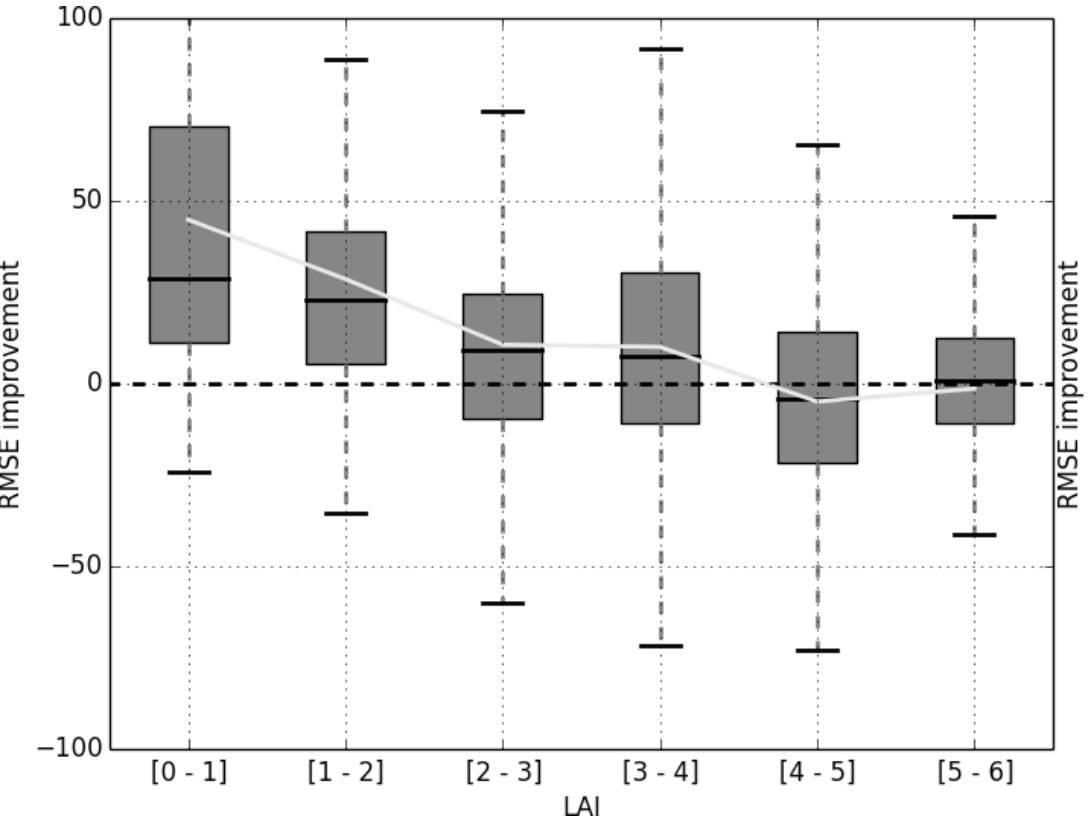
LE







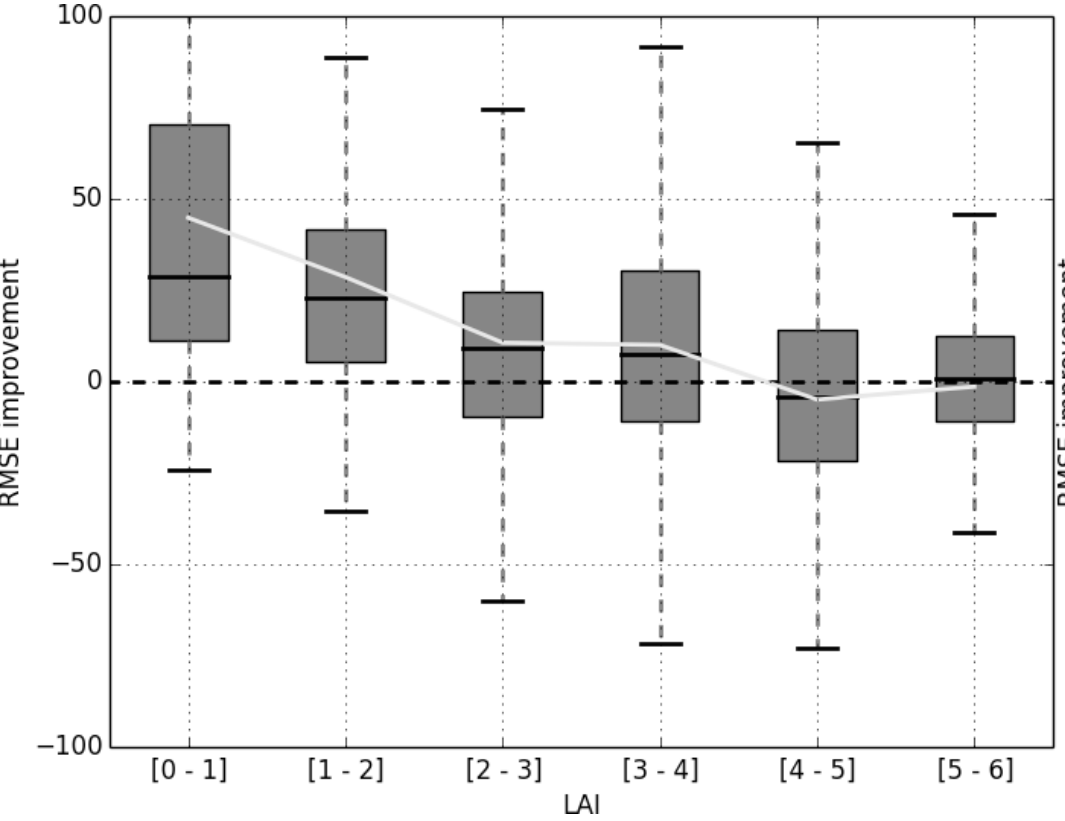
Résultats sur tous sites et années, pas de temps semi horaire



H

Différence relative de cRMSE entre MEBL et ISBA

Résultats sur tous sites et années, pas de temps semi horaire



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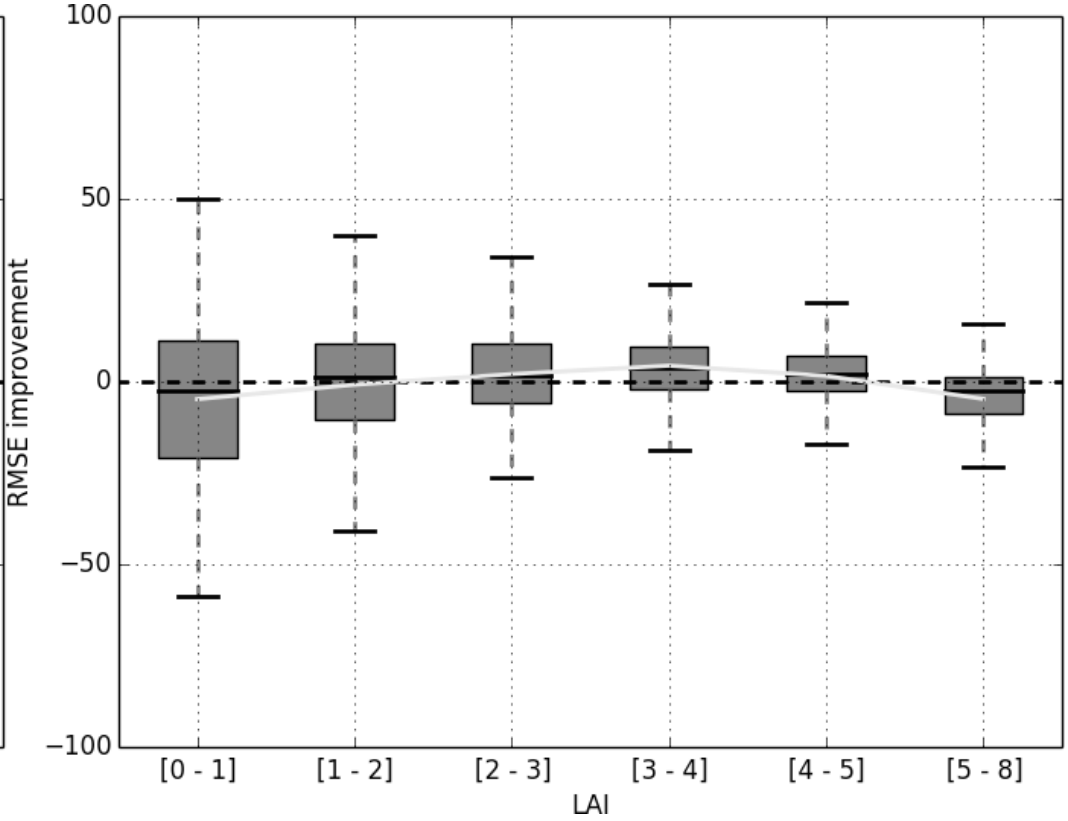

LE

Différence relative de cRMSE entre MEBL et ISBA

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CONCLUSION

Évaluations sur la France montrent une amélioration :

- Du flux de chaleur dans le sol G
- Du flux de chaleur sensible H
- Des températures de sol

Benchmark :

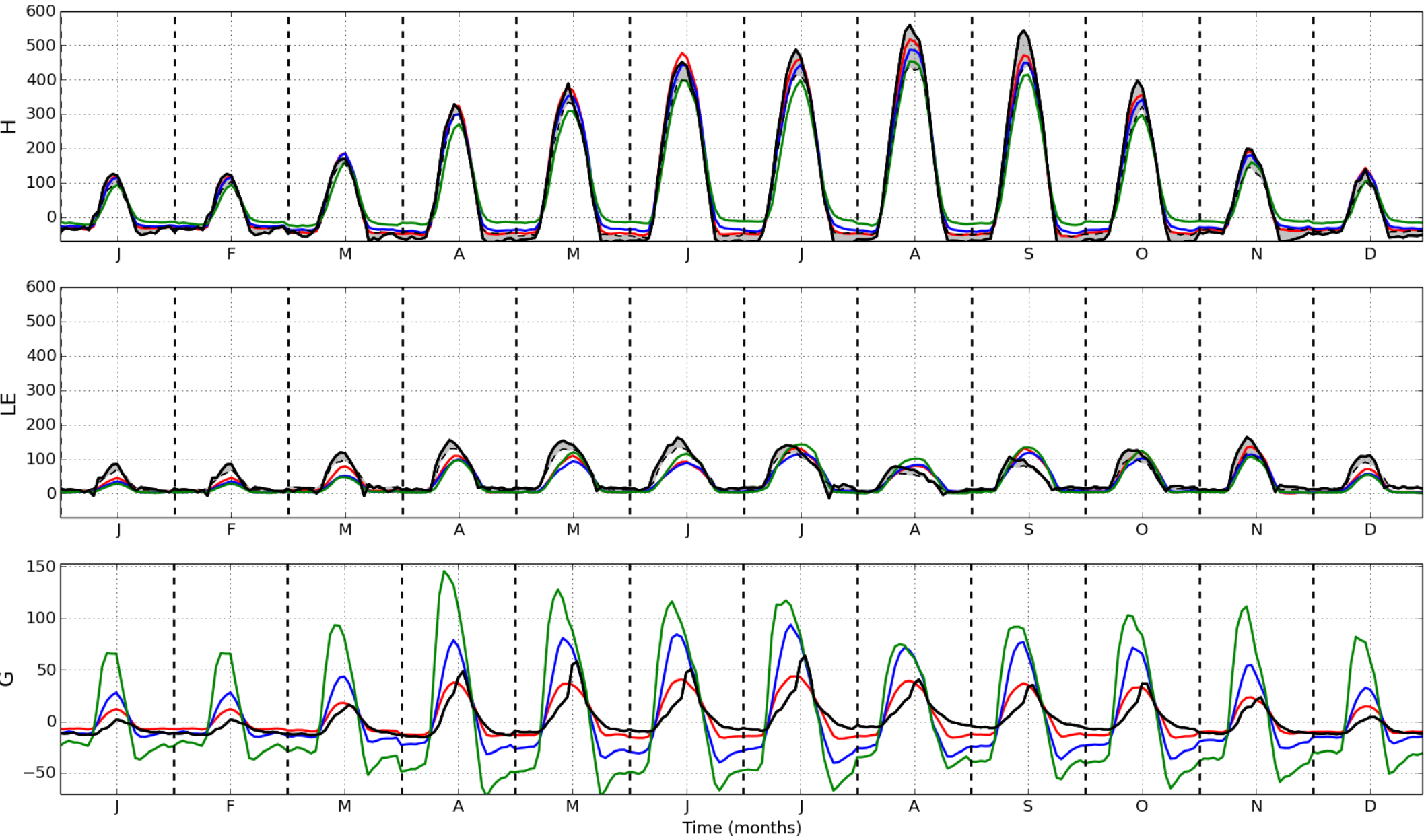
- Cohérence avec les résultats précédents
- Intérêt en particulier pour les faibles à moyens LAI

Perspectives :

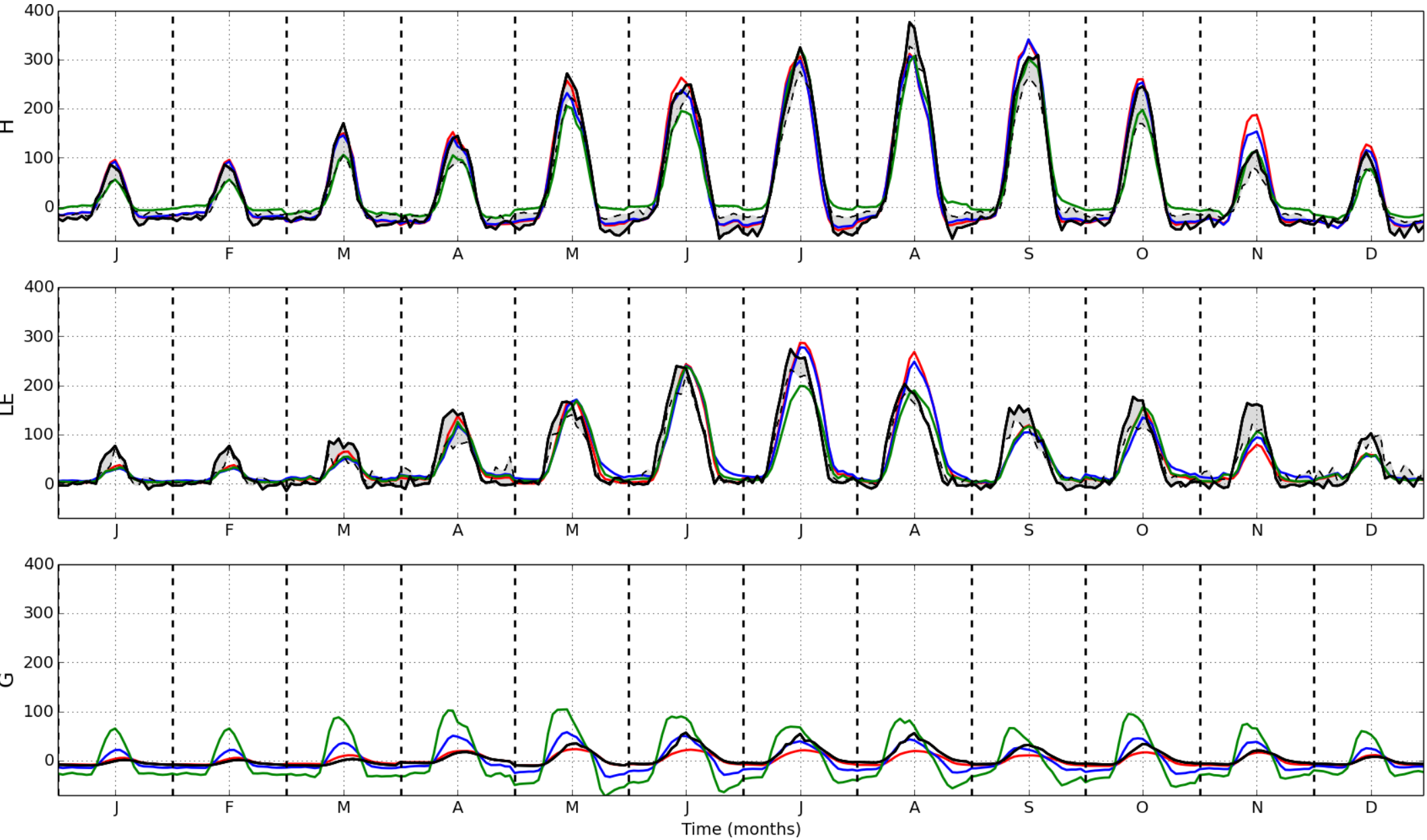
- Court terme : Impact sur les débits des rivières en France à l'aide de la chaine Safran-ISBA-Modcou (SIM)
- Moyen terme : Test forcé, échelle globale
- Moyen terme : Test couplé, échelle globale

ANNEXES

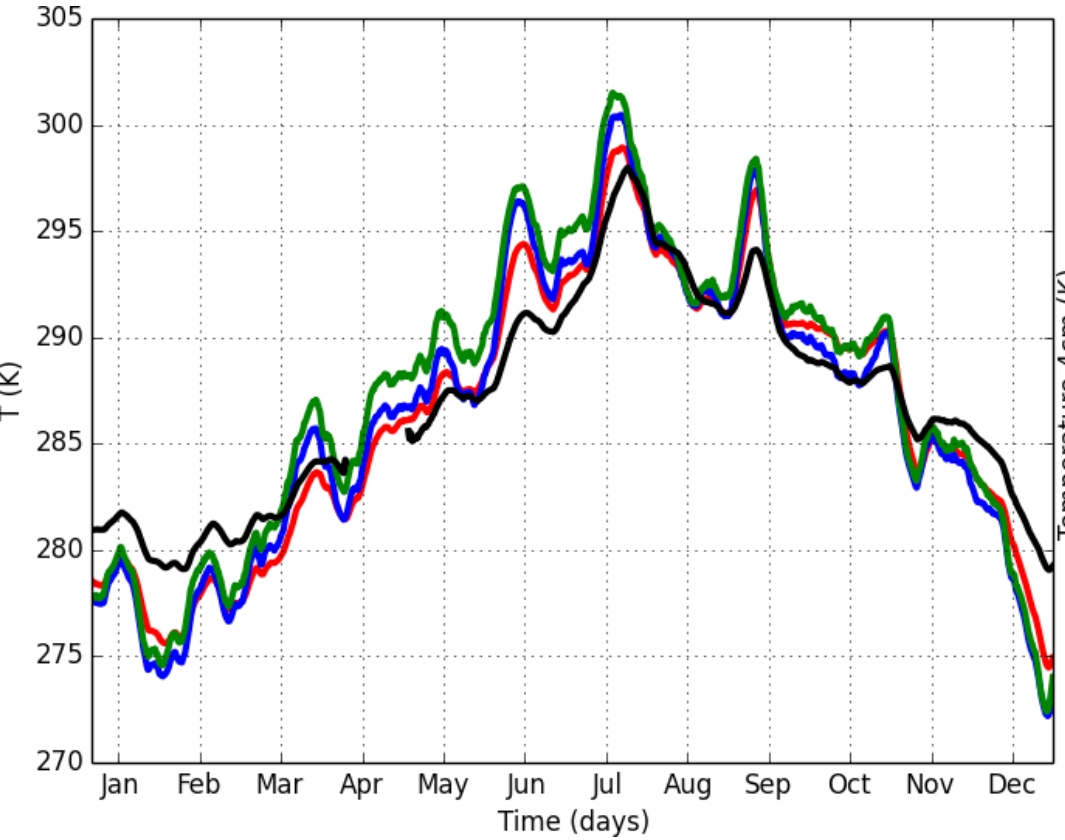
FONTBLANCHE

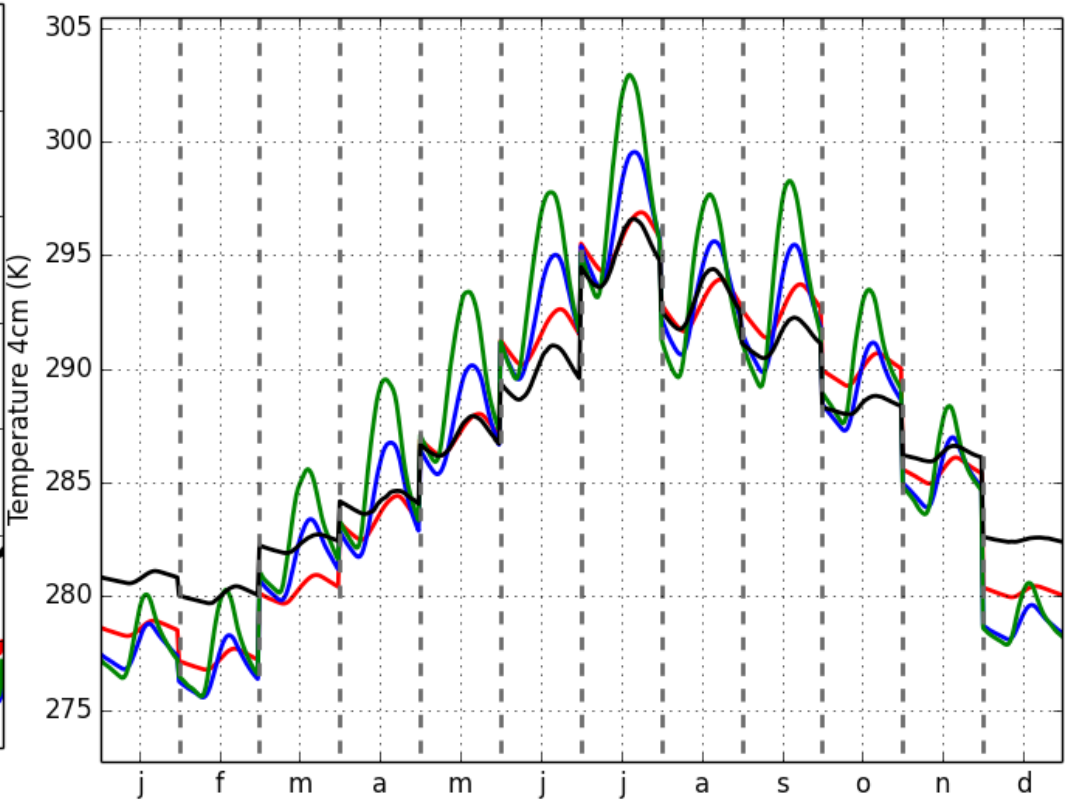


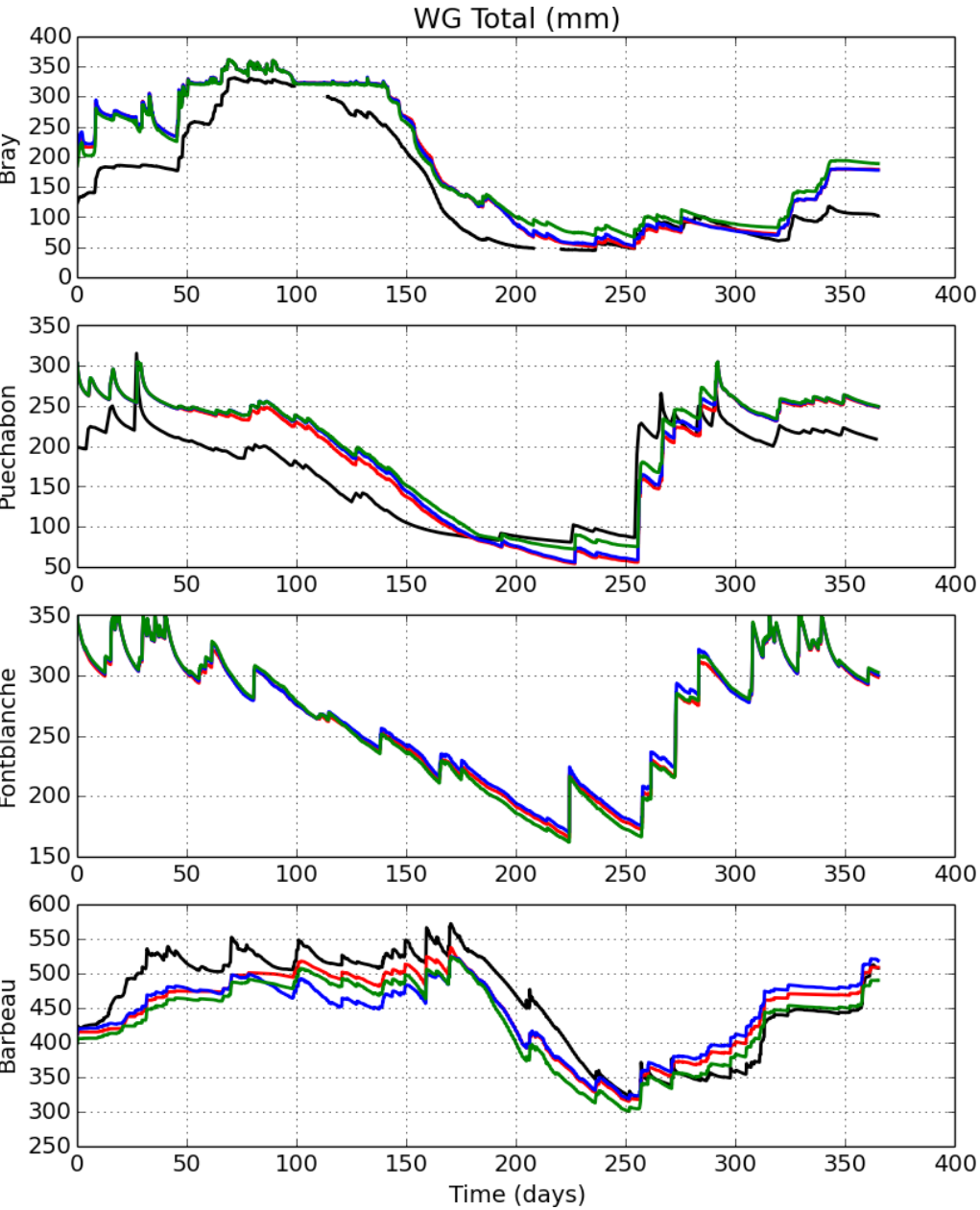
Le Bray

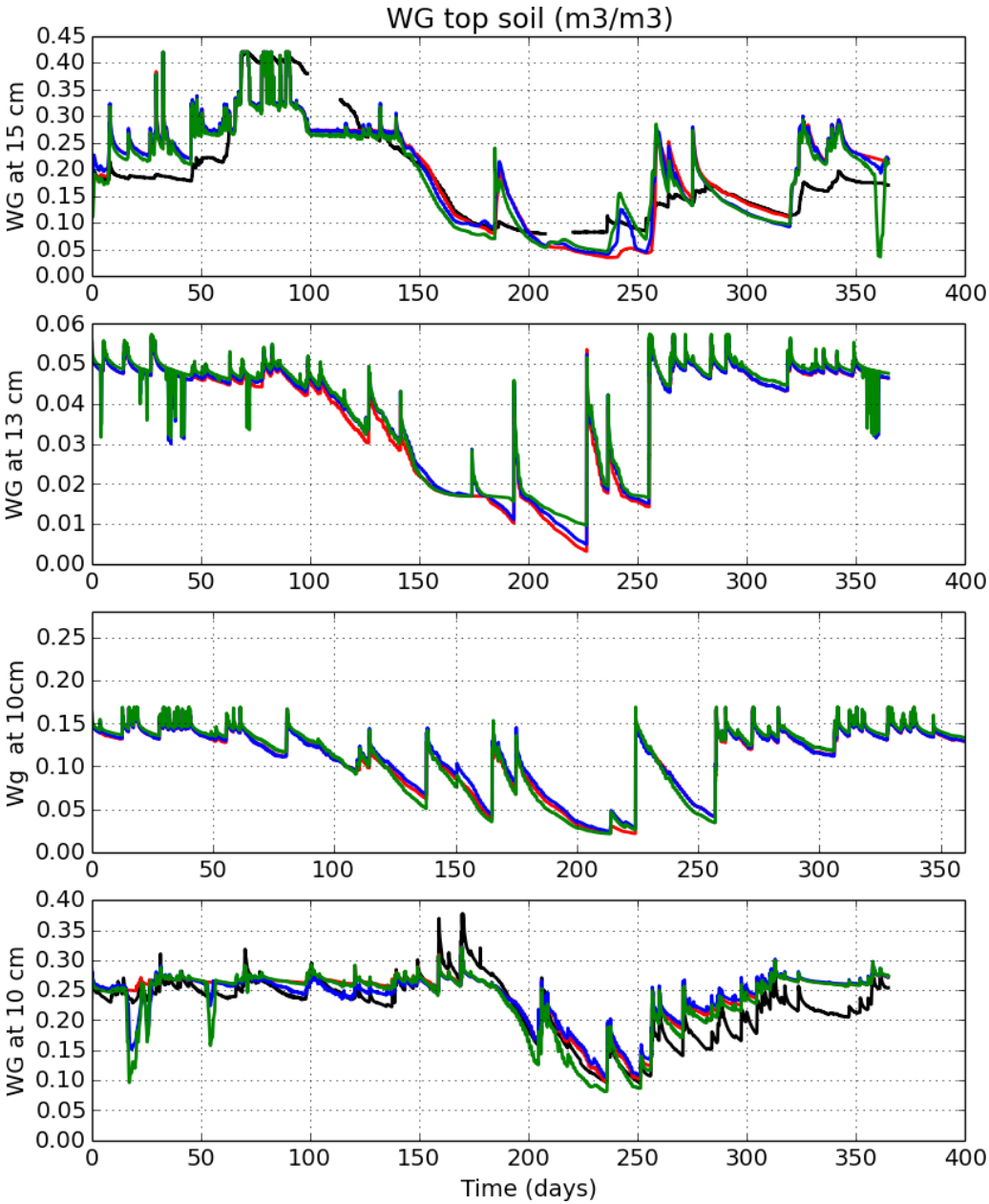


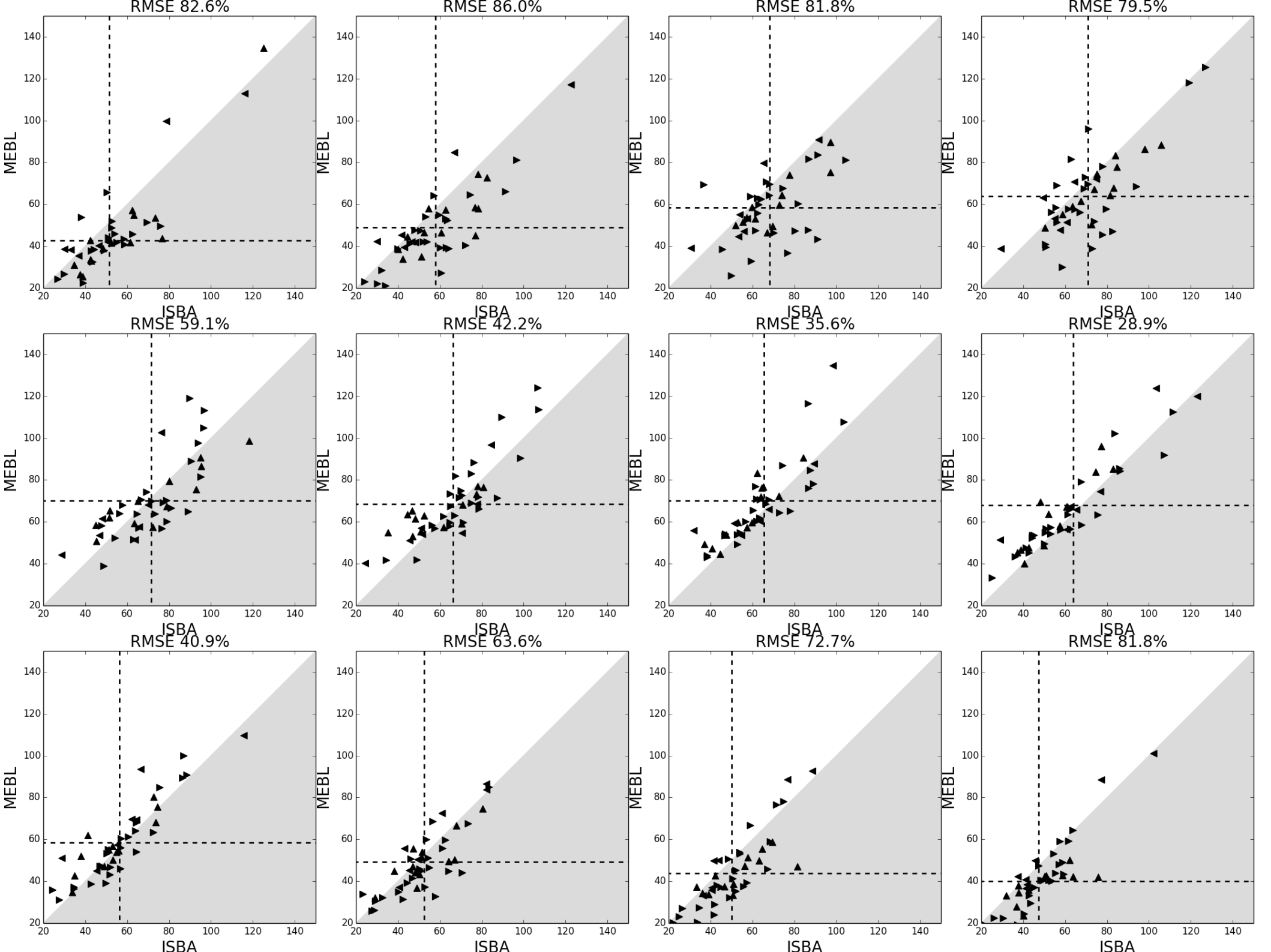
Le Bray

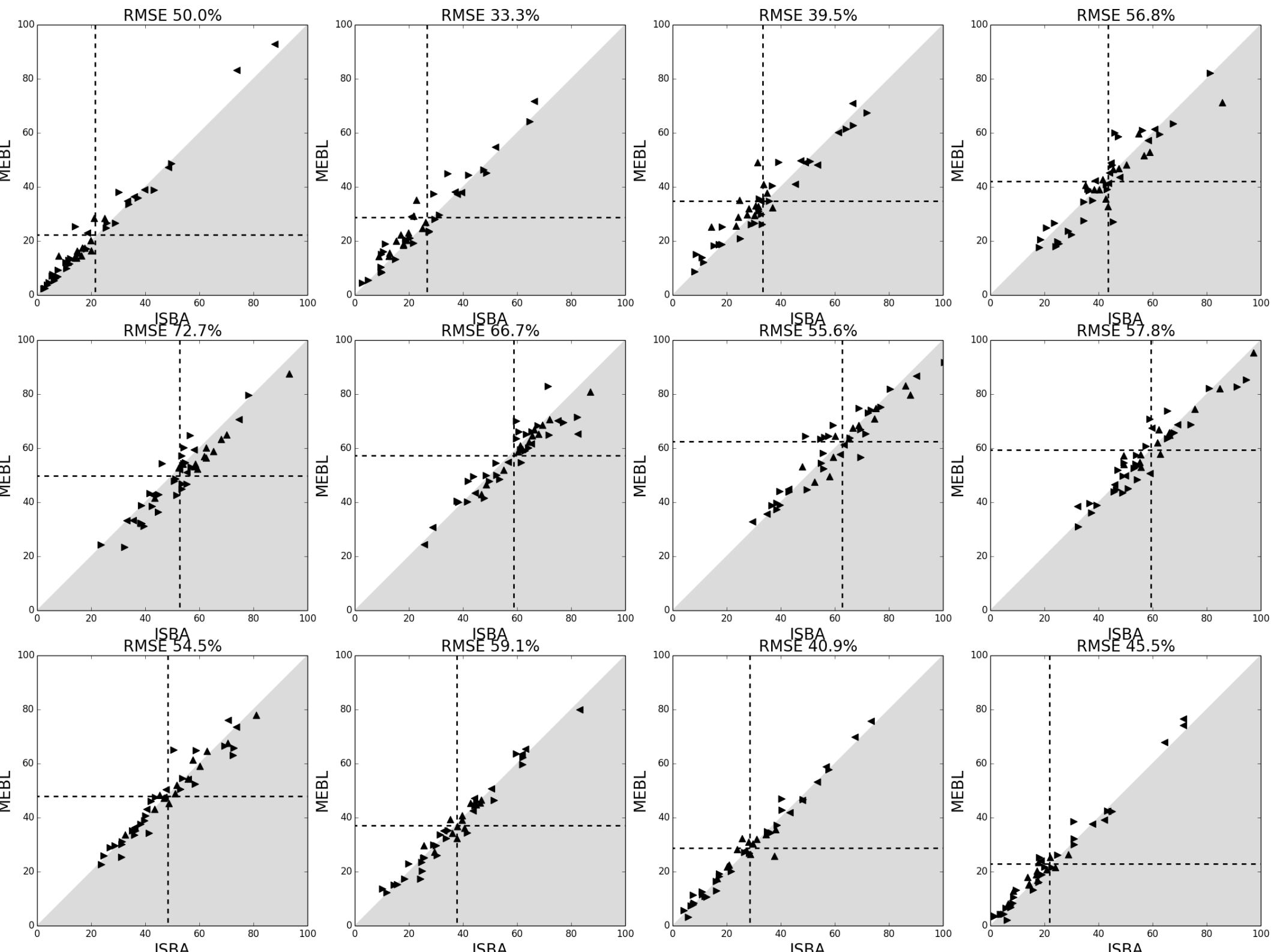

305
300
295
290
285
280
275
270
T (K)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time (days)

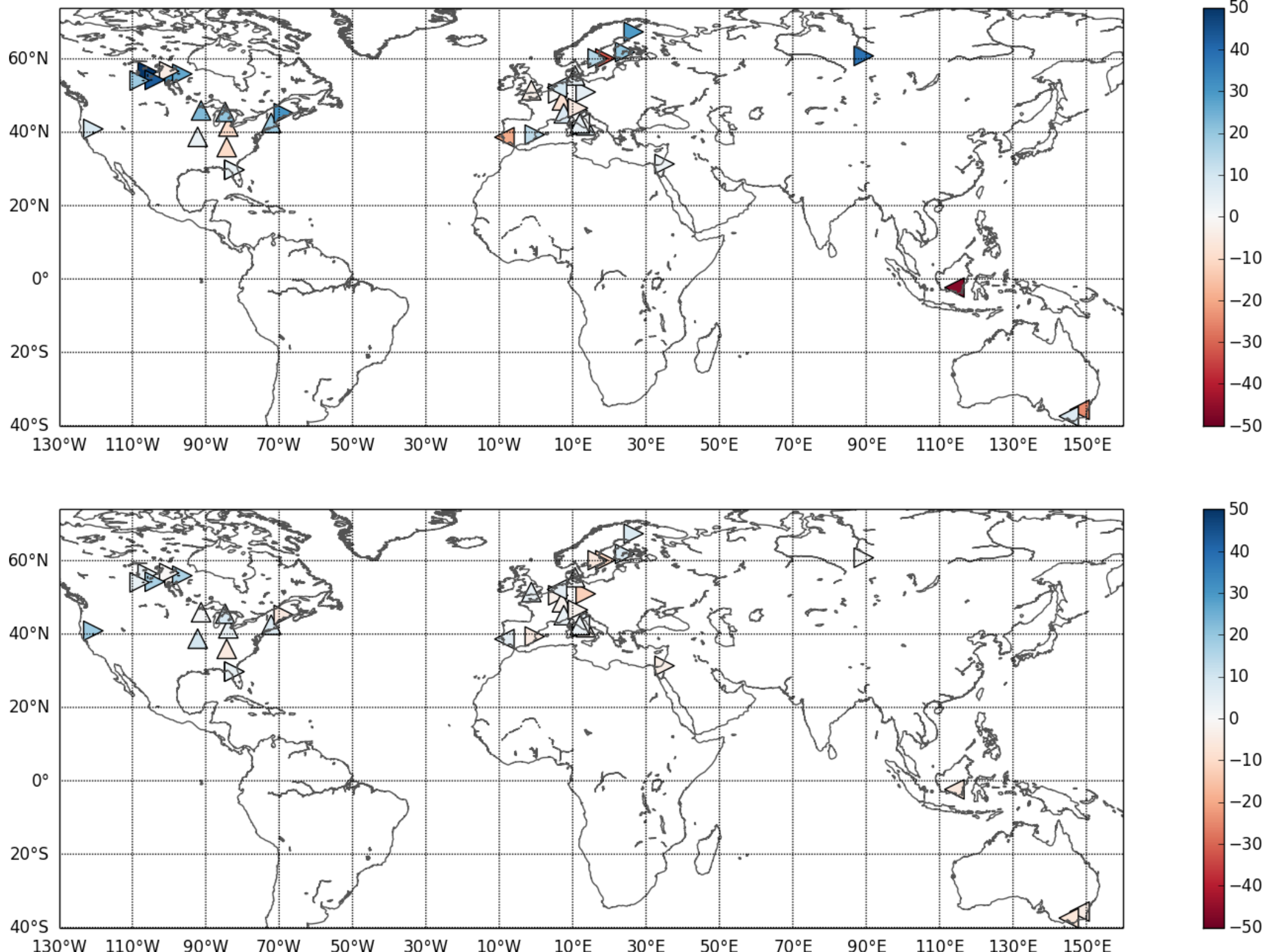

305
300
295
290
285
280
275
Temperature 4cm (K)
j
f
m
a
m
j
j
a
s
o
n
d


WG Total (mm)
Bray
Puechabon
Fontblanche
Barbeau
Time (days)


WG top soil (m3/m3)
WG at 15 cm
WG at 13 cm
Wg at 10cm
WG at 10 cm
Time (days)


RMSE 82.6%
RMSE 86.0%
RMSE 81.8%
RMSE 79.5%
RMSE 59.1%
RMSE 42.2%
RMSE 35.6%
RMSE 28.9%
RMSE 40.9%
RMSE 63.6%
RMSE 72.7%
RMSE 81.8%
MEBL
ISBA
20
40
60
80
100
120
140


RMSE 50.0%
RMSE 33.3%
RMSE 39.5%
RMSE 56.8%
RMSE 72.7%
RMSE 66.7%
RMSE 55.6%
RMSE 57.8%
RMSE 54.5%
RMSE 59.1%
RMSE 40.9%
RMSE 45.5%
MEBL
ISBA
0
20
40
60
80
100


60°N
40°N
20°N
0°
20°S
40°S
130°W
110°W
90°W
70°W
50°W
30°W
10°W
10°E
30°E
50°E
70°E
90°E
110°E
130°E
150°E
50
40
30
20
10
0
−10
−20
−30
−40
−50

Why are the PLUMBER results so terrible?

A diagnostic evaluation of the errors in land-surface model simulations across FLUXNET sites

Martyn Clark[1], Bart Nijssen[2], Ned Haughton[3] and Gab Abramowitz[3]

1. NCAR
2. University of Washington
3. University of New South Wales, Australia

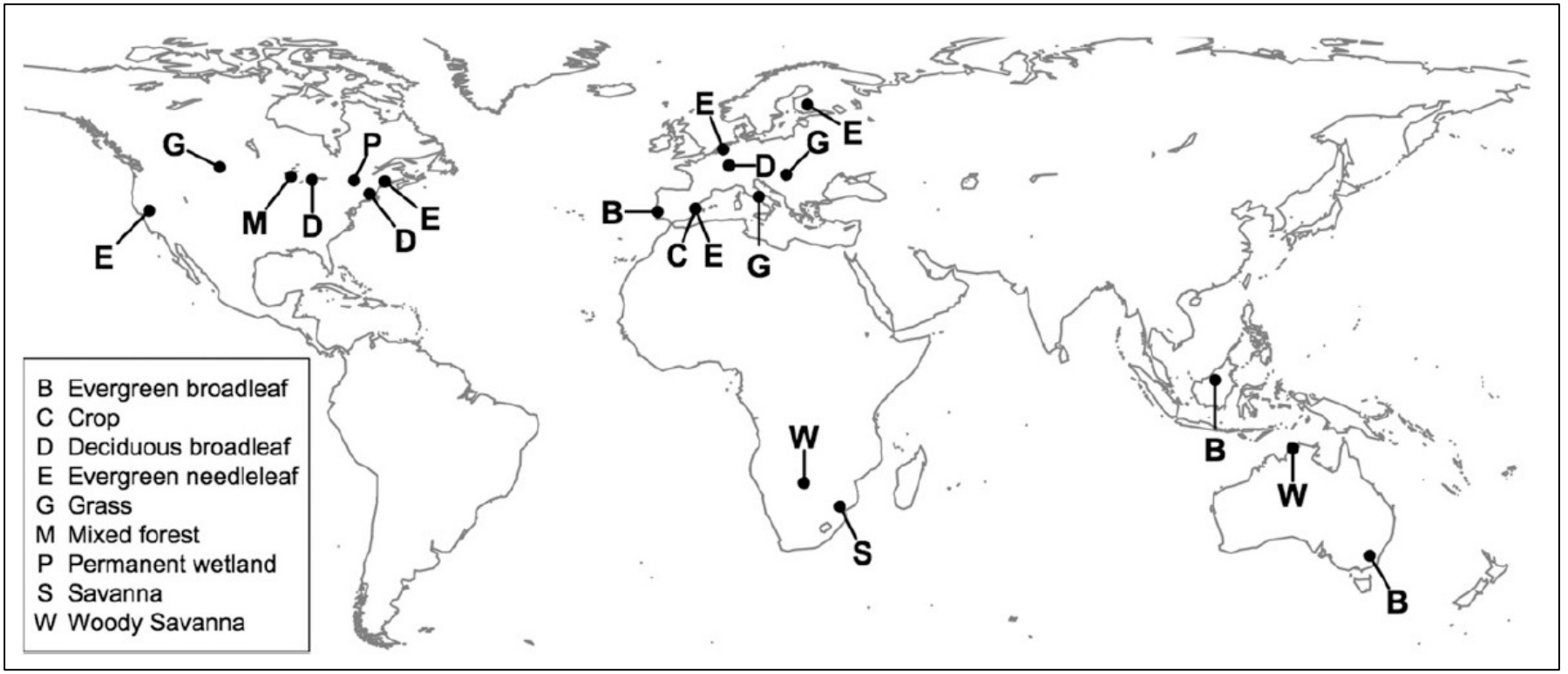
The **P**rotocol for the Analysis of Land Surface Models (PALS) **L**and S**u**rface **M**odel **B**enchmarking **E**valuation P**r**oject (PLUMBER) is a land surface model (LSM) benchmarking intercomparison experiment

Terrestrial Water Cycle Seminar, NASA
8 October 2015

NCAR
UCAR

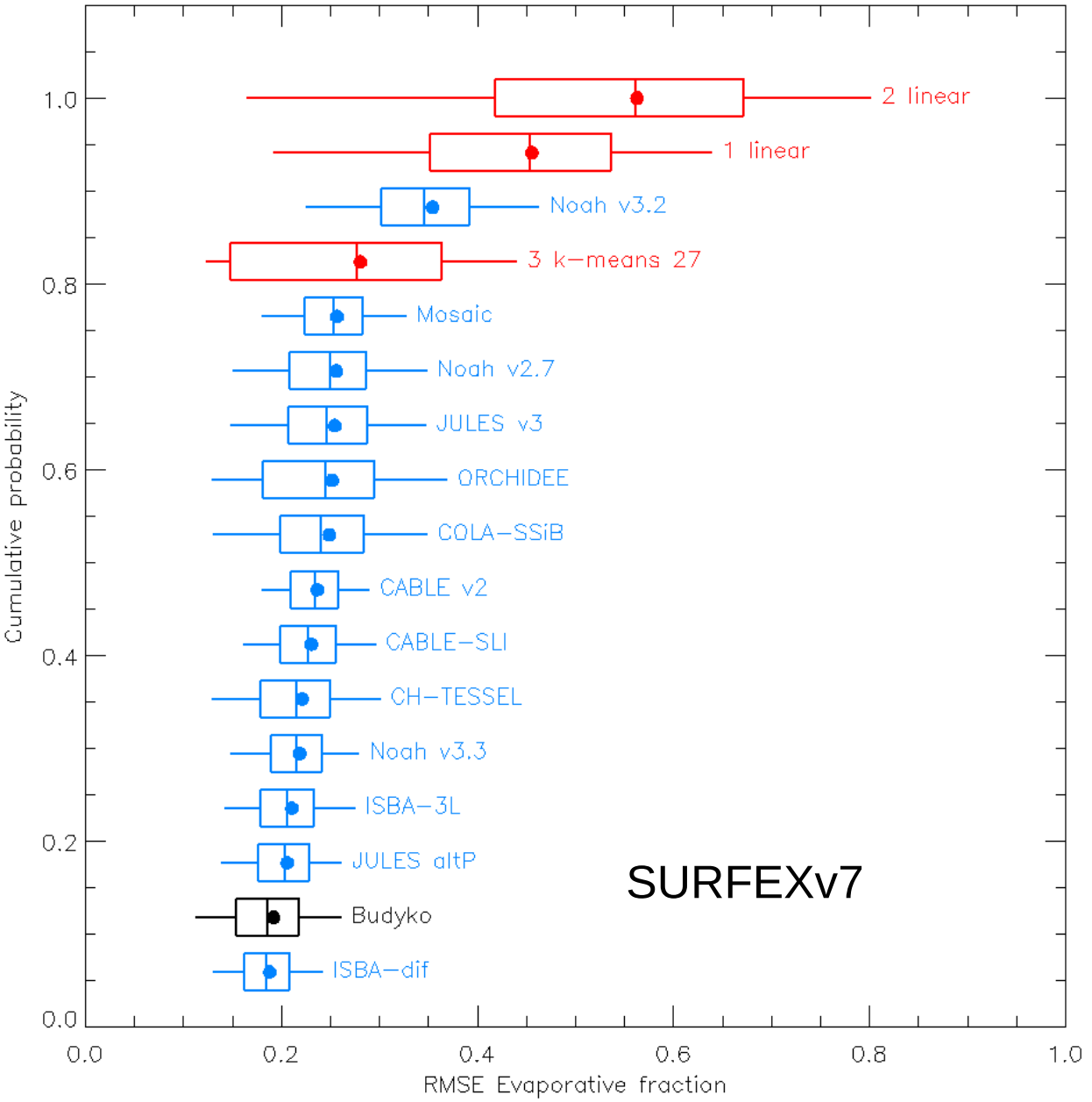
The PLUMBER experiment

- 13 land models applied to 20 flux sites around the world
  - CABLE, CABLE-SLI, CH-TESSEL, COLA-SSiB, ISBA-3L, ISBA-Dif, JULES, JULES-altP, Mosaic, Noah 2.7.1, Noah 3.2, Noah 3.3, ORCHIDEE
- Models compared to statistical and physical benchmarks
  - Physical: Penman and Manabe
  - Statistical: 1-var regression, 2-var regression, 3-var local regression
  - **Purpose**: Comparison with statistical benchmarks intended to quantify the extent to which models adequately use information in available forcing



Analysis of the PLUMBER models within a Budyko framework

- Approach
  - RMSE across the 20 fluxnet sites
  - Impact of the small sample size is characterized by resampling the sites (with replacement) 1000 times
- Results
  - Most of the land models actually outperform the statistical models.
  - The Budyko curve provides better predictions than most of the land models, suggesting that the land models are incapable of predicting departures from the Budyko curve.
- The conclusions of PLUMBER still hold, with a simple model (Budyko) outperforming **most** land models.

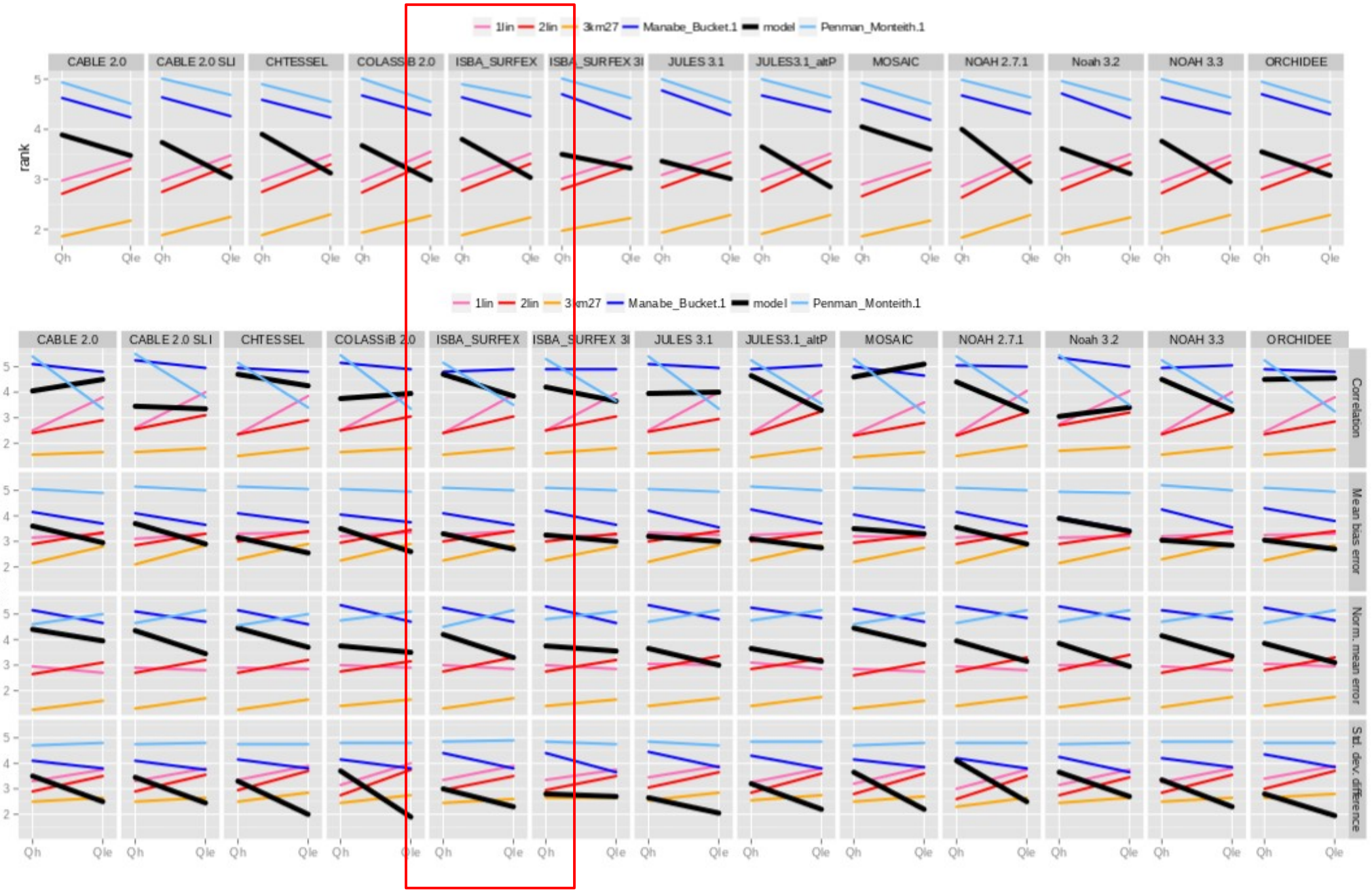


The PLUMBER experiment

Best, M.J., G. Abramowitz, H. Johnson, A.J. Pitman, A. Boone, M. Cuntz, B. Decharme, P.A. Dirmeyer, J. Dong, M. Ek, V. Haverd, B.J.J.M van den Hurk, G.S. Nearing, B. Pak, C. Peters-Lidard, J.A. Santanello Jr., L. Stevens, N. Vuichard, 2015: The plumbing of land surface models. *J. Hydrometeor.*, **16,** 1425-1442. doi: http://dx.doi.org/10.1175/JHM-D-14-0158.1

Haughton, N., G. Abramowitz, A. J. Pitman, D. Or, M. J. Best, H. R. Johnson, G. Balsamo, A. Boone, M. Cuntz, B. Decharme, P. A. Dirmeyer, J. Dong, M. Ek, Z. Guo, V. Haverd, B. J. van den Hurk, G. S. Nearing, B. Pak, C. Peters-Lidard, J. A. Santanello Jr., L. Stevens, and N. Vuichard, 2015: The plumbing of land surface models: why are models performing so poorly? *J. Hydrometeor.,* (submitted).

Martyn Clark, NCAR, Terrestrial Water Cycle Seminar, NASA, 8 October 2015
(work to be presented at AMS, 2016)



Haughton et al. 2015