

Towards regional C fluxes estimation using CHIMERE

Berchet A.¹, I. Pison¹, and F. Chevallier¹.
aberchet@lsce.ipsl.fr

¹Laboratoire des Sciences du Climat et de l'Environnement/IPSL,
CNRS-CEA-UVSQ, Orme des Merisiers, CEA Saclay, Gif-sur-Yvette, France.

12/10/2012

A difficult statement

A complex and important system

- Huge amount of sequestered carbon

A difficult statement



A difficult statement

A complex and important system

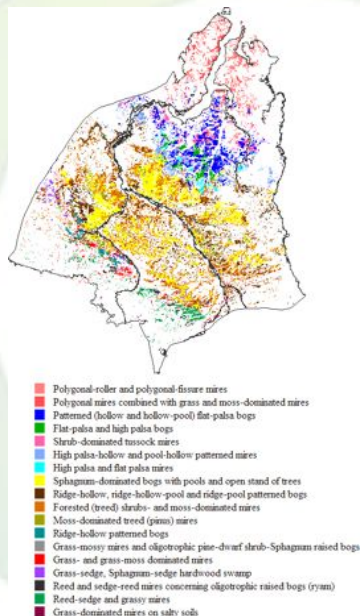
- Huge amount of sequestrated carbon
- Many different types of vegetation

A difficult statement

A complex and important system

- Huge amount of sequestered carbon
- Many different types of vegetation
- Very sensitive to climatological conditions

A difficult statement



A difficult statement

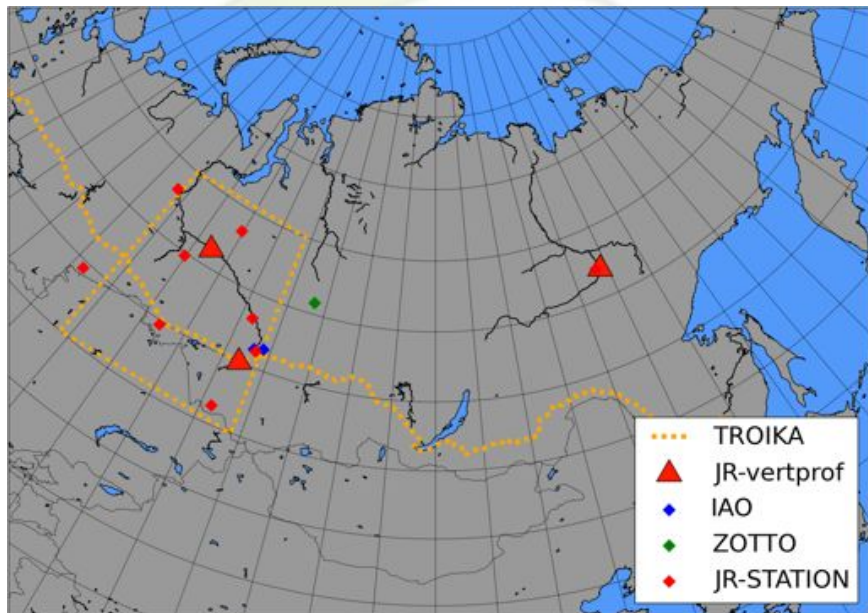
A complex and important system

- Huge amount of sequestered carbon
- Many different types of vegetation
- Very sensitive to climatological conditions

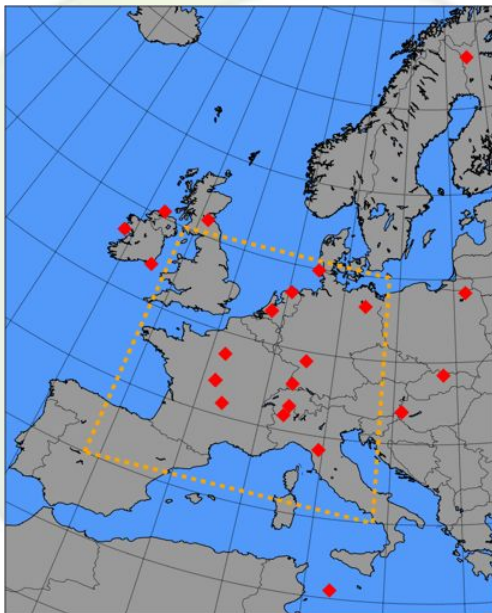
Huge efforts for few observations

- JR-STATION: 9 stations
- IAO network: 3 stations
- ZOTTO: 1 tall tower
- TROICA: Transsiberian equipped coach
- JR vertical profiles: airborne recurrent profiles at 3 sites
- YAK-AEROSIB
- +flux observations

A difficult statement



A difficult statement



A difficult statement

A complex and important system

- Huge amount of sequestered carbon
- Many different types of vegetation
- Very sensitive to climatological conditions

Huge efforts for few observations

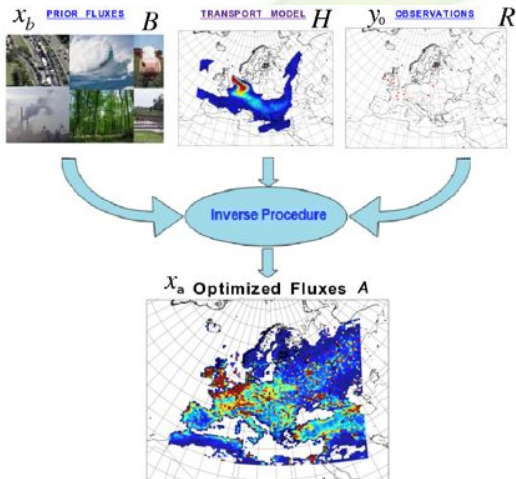
- JR-STATION: 9 stations
- IAO network: 3 stations
- ZOTTO: 1 tall tower
- TROICA: Transsiberian equipped coach
- JR vertical profiles: airborne recurrent profiles at 3 sites
- YAK-AEROSIB
- +flux observations

An unreachable expectation

- Spatial distribution of surface fluxes for CO₂ and CH₄ and other C-related species
- Temporal variability
- Process understanding and predictability



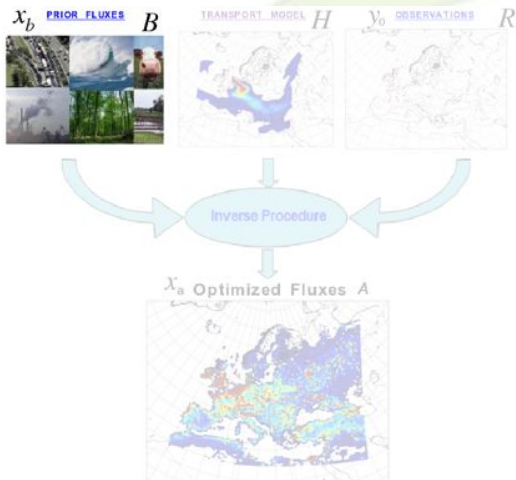
A promising tool: the atmospheric inversion



Inversion

- Improving inventories and prior informations
- Data assimilation theories

A promising tool: the atmospheric inversion



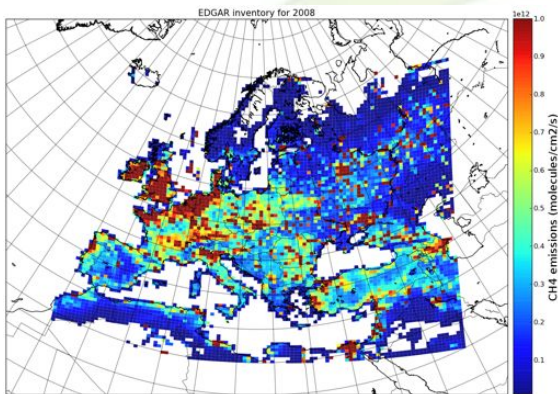
Inversion

- Improving inventories and prior informations
- Data assimilation theories

Regional configuration

- flux model ORCHIDEE
- EDGAR inventories

A promising tool: the atmospheric inversion



*EDGAR v4.2 inventory.
50x50 km aggregation.*

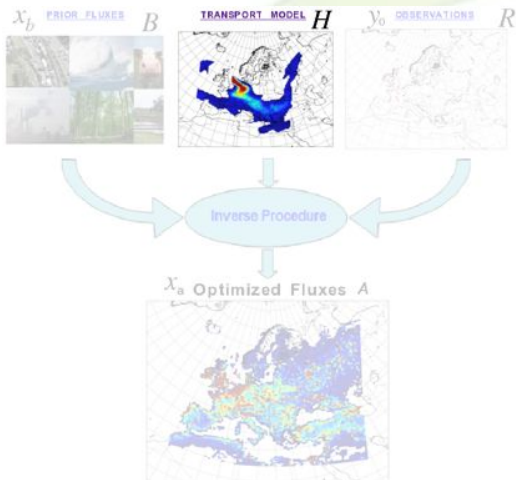
Inversion

- Improving inventories and prior informations
- Data assimilation theories

Regional configuration

- flux model ORCHIDEE
- EDGAR inventories

A promising tool: the atmospheric inversion



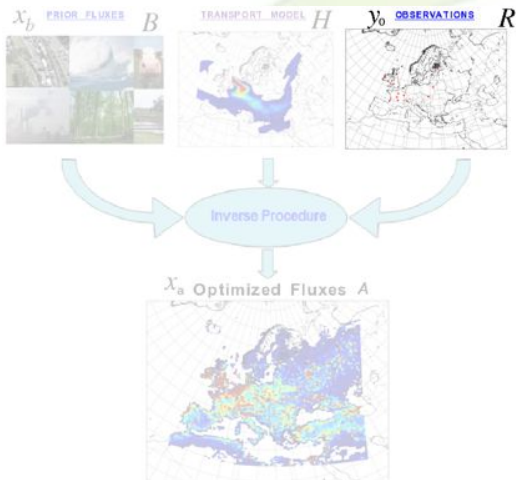
Inversion

- Improving inventories and prior informations
- Data assimilation theories

Regional configuration

- flux model ORCHIDEE
- EDGAR inventories
- CTM CHIMERE

A promising tool: the atmospheric inversion



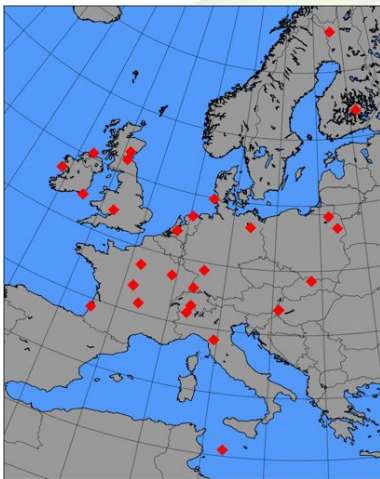
Inversion

- Improving inventories and prior informations
- Data assimilation theories

Regional configuration

- flux model ORCHIDEE
- EDGAR inventories
- CTM CHIMERE
- ground-based observations

A promising tool: the atmospheric inversion



Available ground observations in Europe.

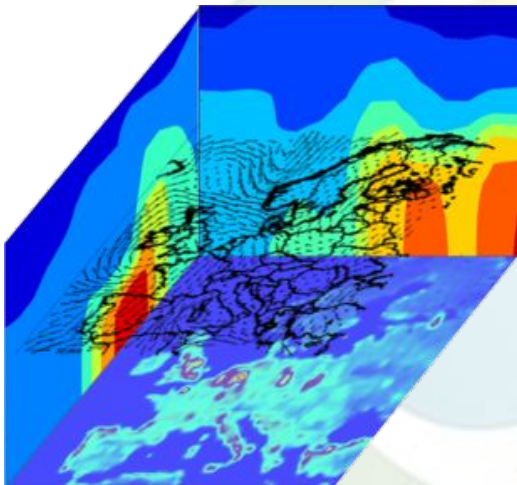
Inversion

- Improving inventories and prior informations
- Data assimilation theories

Regional configuration

- flux model ORCHIDEE
- EDGAR inventories
- CTM CHIMERE
- ground-based observations

The regional approach with CHIMERE model

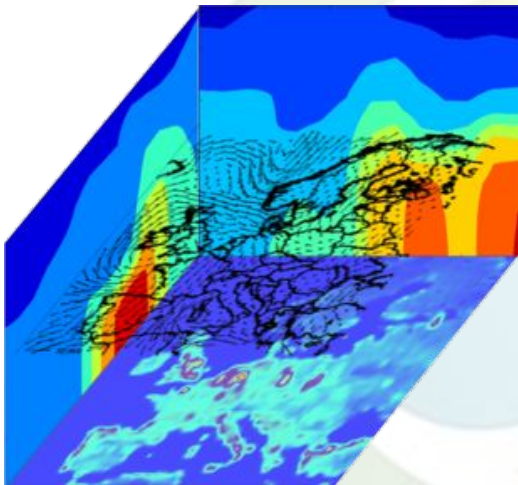


A 3D domain for CHIMERE.

Strong community

- Designed from late 90's
- Proven high resolution efficiency
- Parallelized mode with adjoint model
- Numerous studies in air pollution

The regional approach with CHIMERE model



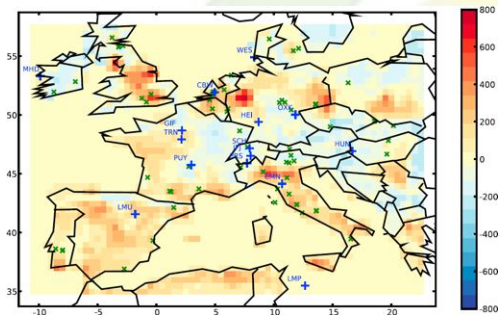
A 3D domain for CHIMERE.

Strong community

- Designed from late 90's
- Proven high resolution efficiency
- Parallelized mode with adjoint model
- Numerous studies in air pollution

Strong expertise at LSCE

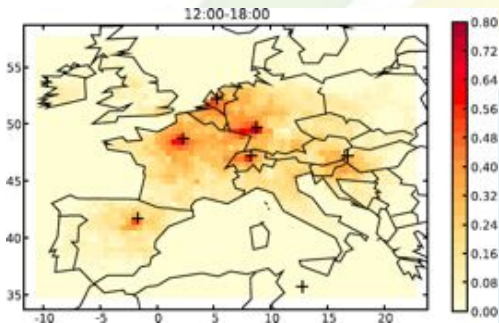
- INVSAT team: 30 people
- Global inversion with TCCON, ground network and satellites
- Mesoscale inversions
- Variational system PYVAR



Reference work

- Inversion of CO₂ on Europe

*CHIMERE CO₂ inversion domain:
Prior fluxes and stations.
From Broquet et al., 2011.*

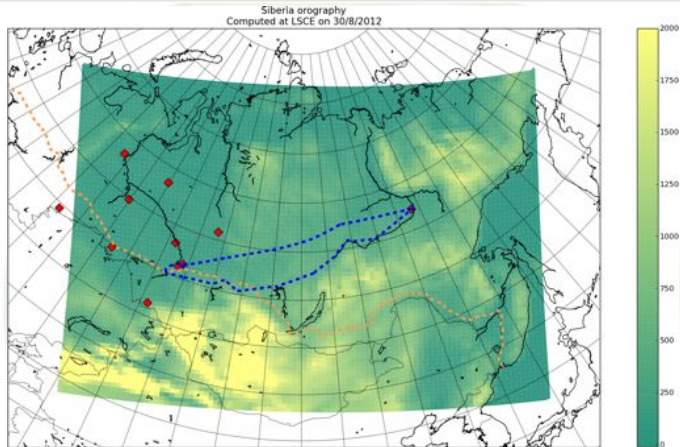


*CO₂ uncertainties reduction.
From Broquet et al., 2011.*

Reference work

- Inversion of CO₂ on Europe
- Significant reduction of uncertainties

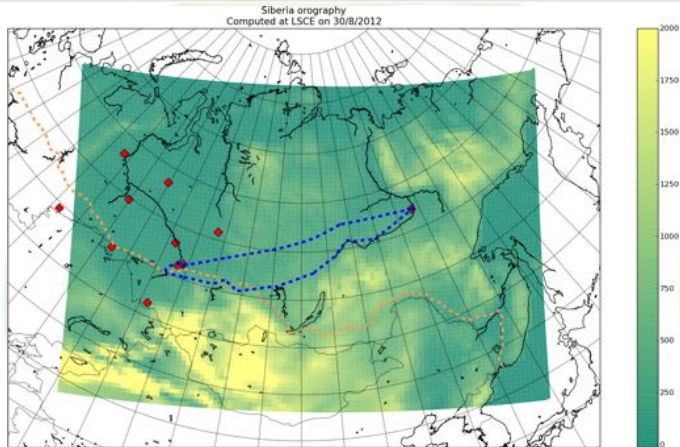
Speculation on Siberia



Translation of system

- Easily feasible in theory

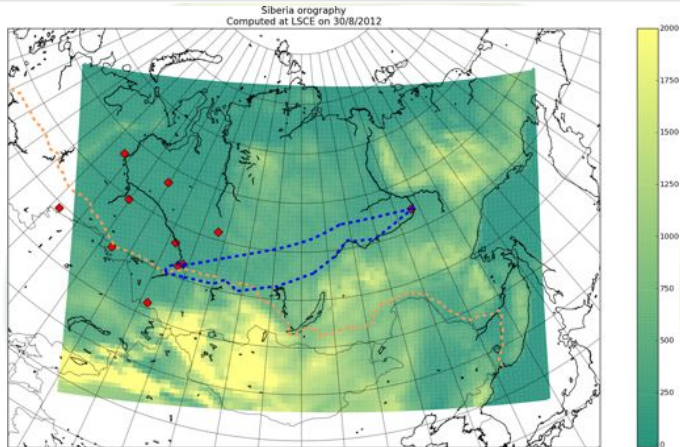
Speculation on Siberia



Translation of system

- Easily feasible in theory
- Choice of inventories and process modelling

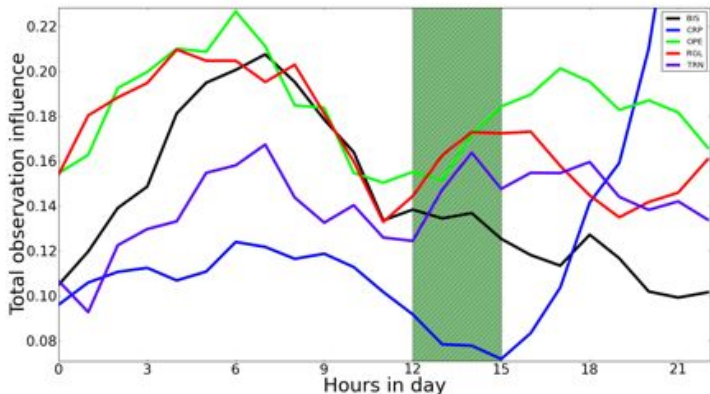
Speculation on Siberia



Translation of system


- Easily feasible in theory
- Choice of inventories and process modelling
- Boundary conditions issue

Speculation on Siberia



Translation of system

- Easily feasible in theory
- Choice of inventories and process modelling
- Boundary conditions issue
- Rough data selection



Thank you for your attention