SCIENTIFIC RECOMMENDATIONS
LAND-ATMOSPHERE: BIOMASS ESTIMATES

geoland

Co-funded by the European Commission within the GMES initiative in FP-6

Scientific recommendations
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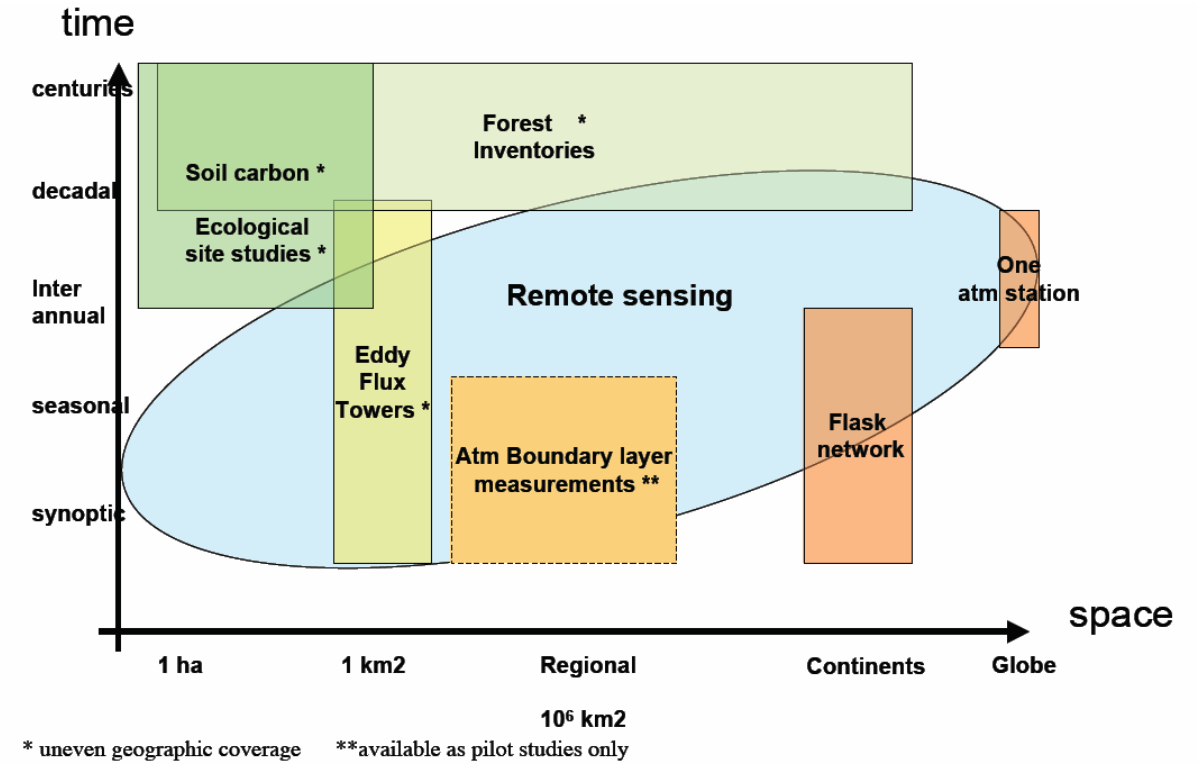
Carbon fluxes: a multi-scale problem



No single data set able to quantify Carbon Fluxes: Different kinds of in situ and EO data have to be integrated into a modelling platform

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Land Carbon component of GEOLAND

Objectives

- Improve the current carbon accounting systems

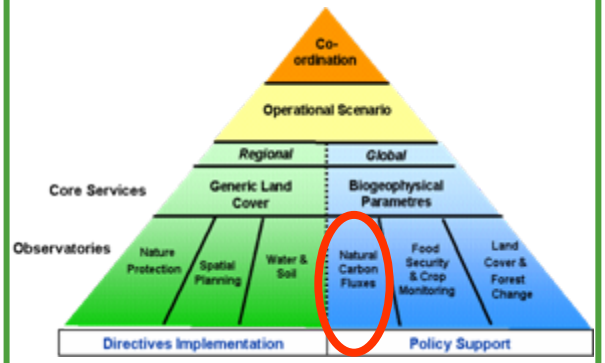
(i.e. National forest inventories with a sampling time of about 10 years)

- Address all temporal scales (hour to decade)

- Global/continental maps on a regular grid:
  - ➢ account for all vegetation types (not only forests)
  - ➢ use all the available data (EO/in situ)

- Assess the uncertainties

geoland (2004-2006): a FP6 contribution to GMES



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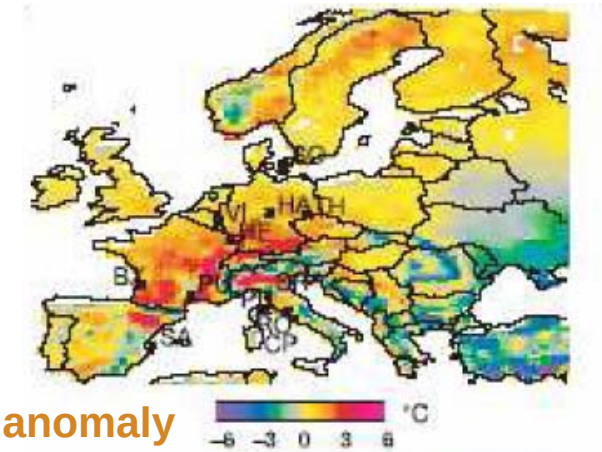
Usefulness of monitoring extreme events

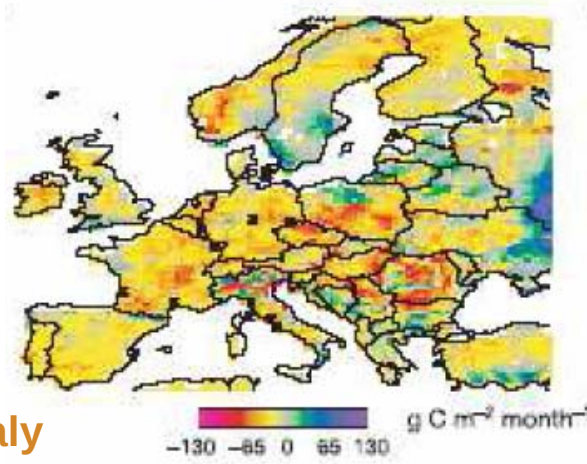
Heat wave of 2003 over Europe

Ciais et al. 2005 (Nature):

- 30% reduction in GPP over Europe
- Anomalous net SOURCE of CO_2 (~0.5 $PgCy^{-1}$)



Air temperature anomaly



NPP anomaly

European-wide anomalies of climate and net primary productivity (NPP) during 2003 (July-September)

All data compare 2003 and the average of 1998–2002.

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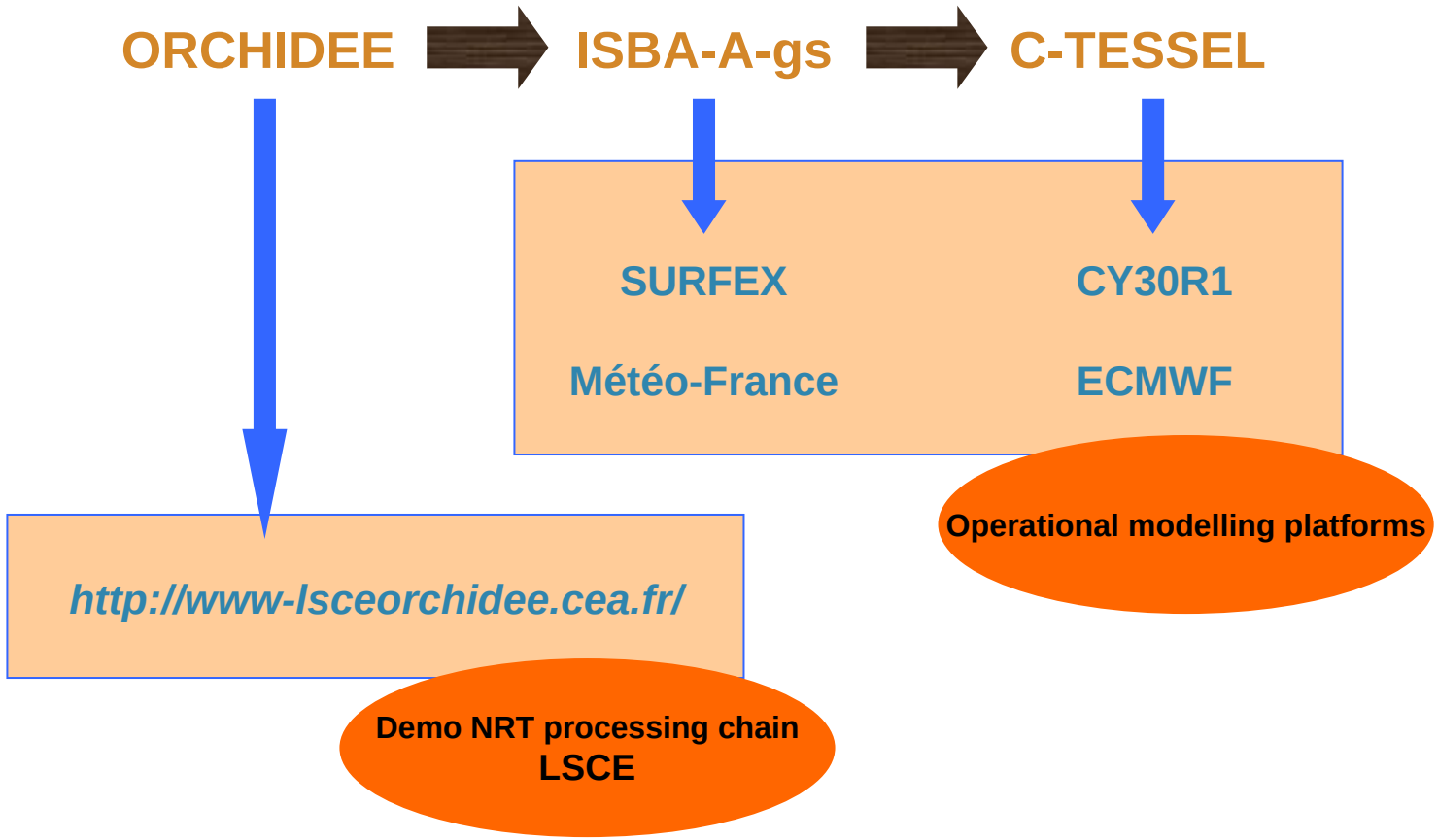
Modelling: „greening“ of operational weather forecast models



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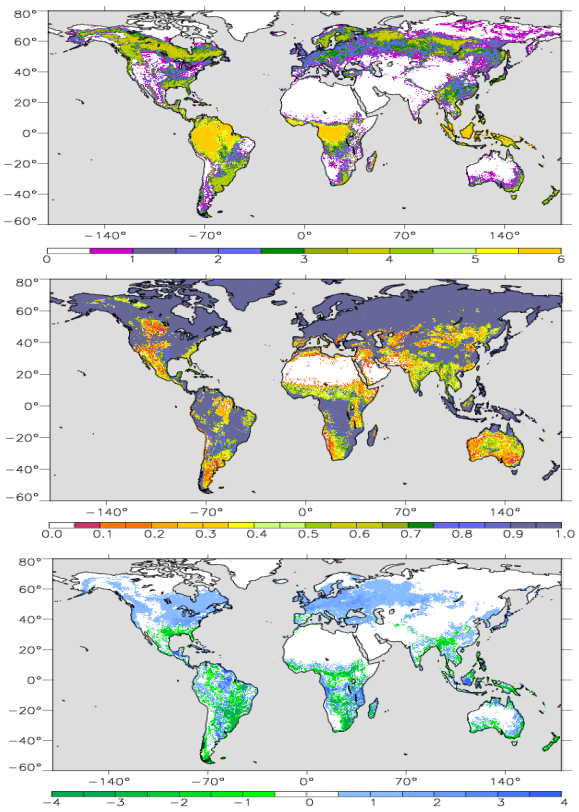
Modelling: demo offline system

http://www-lsceorchidee.cea.fr/

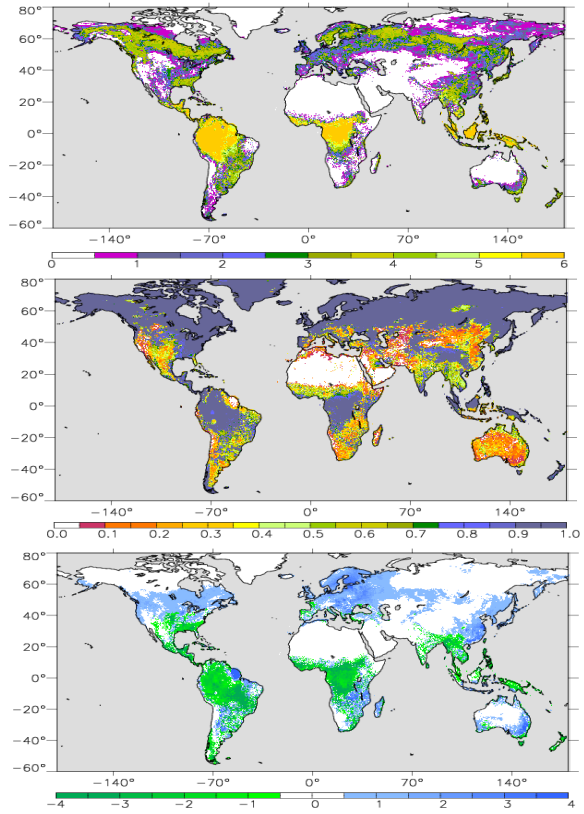
LAI

Soil Moisture

Net carbon flux



1 January 2001



26 November 2006

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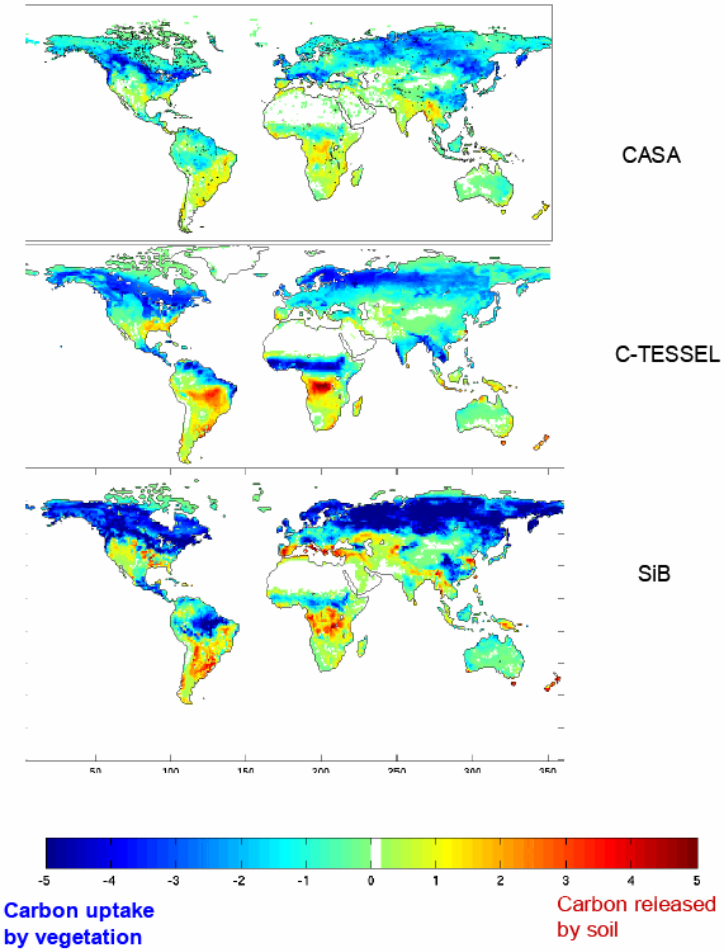
Modelling: benchmarking/validation



Comparison of global C-TESSEL (offline) Carbon flux with other models

(Lafont et al. 2006)

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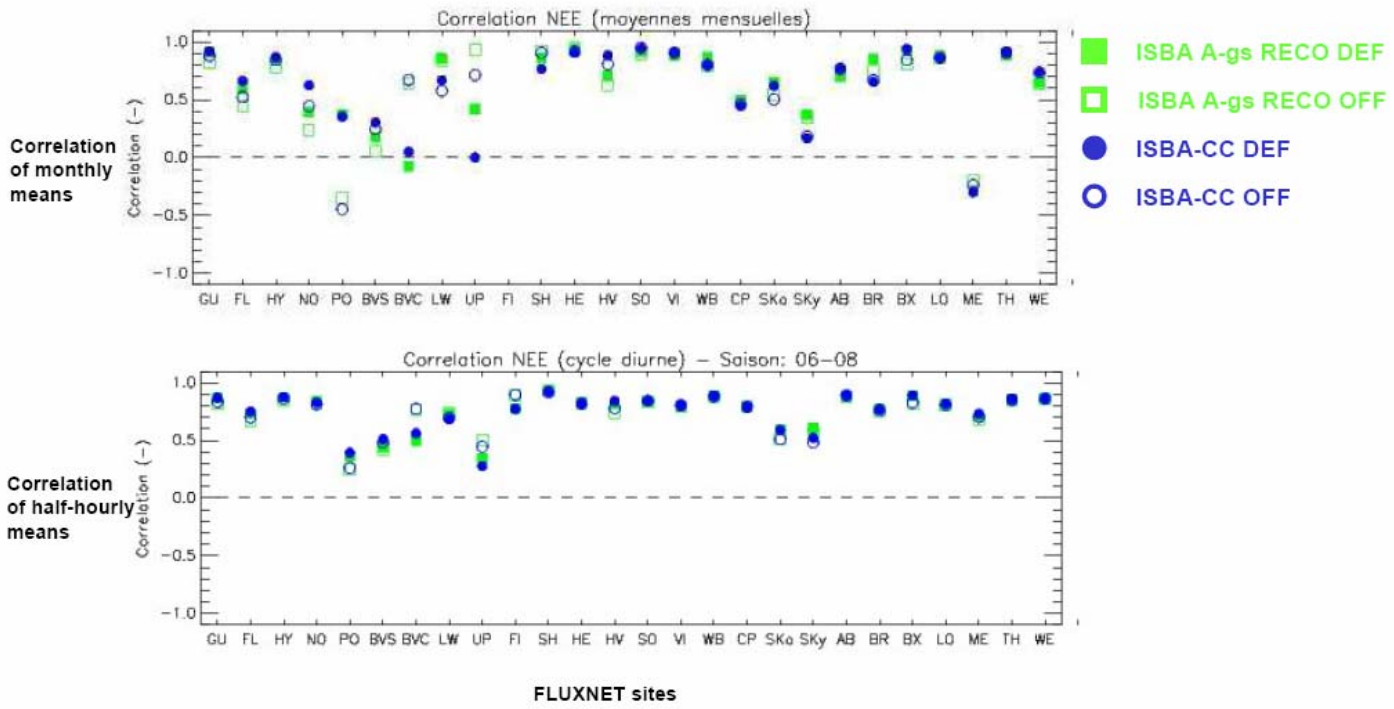
Modelling: benchmarking/validation



Comparison of the NEE simulated by different versions of the ISBA-A-gs model with the measured NEE at 26 FLUXNET sites: model/observation correlation of (top) monthly means, (bottom) summertime (JJA) half-hourly means (source: Gibelin 2006, GEOLAND/ONC)

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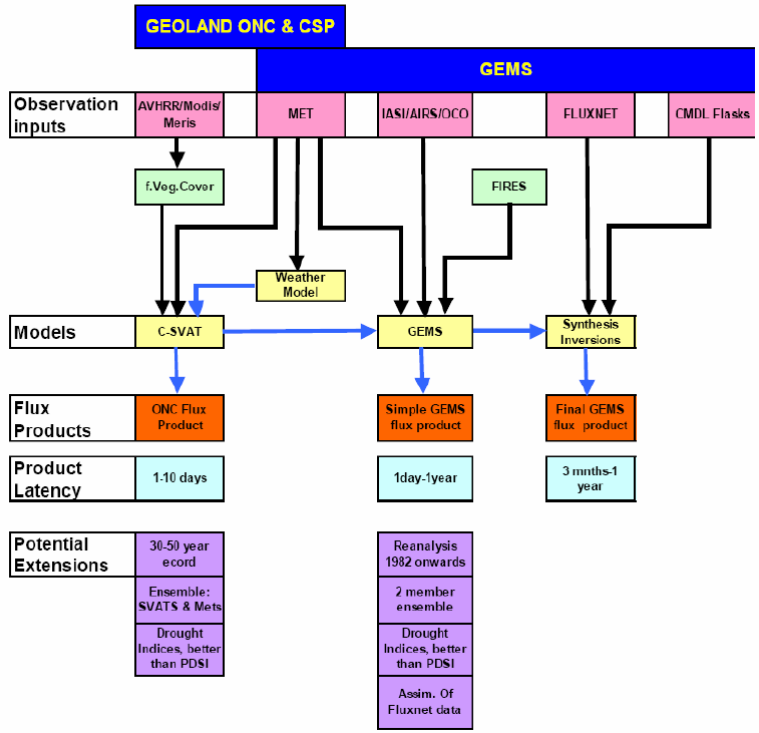
Recommendations: consolidate the GEOLAND-GEMS link

- Common objectives:
  - ➢ monitor the carbon sinks and sources
  - ➢ implementation into the operational platform of ECMWF
- The two approaches are complementary:
  - ➢ top-down (GEMS) versus bottom-up (GEOLAND)
  - ➢ different observations / constraints are used
- Biomass burning:
  - ➢ a “natural” source of CO_2 because it affects vegetation
  - ➢ a GEOLAND/GEMS cross-cutting issue



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Recommendations: use EO / in situ data

- Start operations by using C-TESSEL instead of TESSEL (2007-2008)

- Develop the assimilation of EO data (now)
  - maintain an offline version able to simulate LAI and vegetation biomass
  - prepare the joint assimilation of EO data sensitive to vegetation biomass (e.g. MODIS LAI) and to soil moisture (e.g. ASCAT)
  - R&D on assimilating SYNOP data in an offline system

- Upgrade the offline versions of ECMWF/Météo-France models (2008-2009)
  - wood biomass (↔ forest inventories, biomass burning)
  - soil organic matter (↔ in situ observations, biomass burning)

- Use in situ data available NRT (fluxes and soil moisture) for validation, at least over Europe

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Recommendations: requirements of NRT EO data (vegetation, water)

Vegetation

Vegetation Parameters	NRT / Off-line?	Time coverage	Spatial coverage	Time resolution	Spatial resolution	Availability Date	Priority order
LAI	NRT and off-line	Time series as long as possible	Regional(1) Global(2)	10-day	1km (1) 0.25° (2)	2008	1
FCover	Off-line	Time series as long as possible	Regional(1) Global(2)	10-day	1km (1) 0.25° (2)	2008	1
Burnt Areas	Off-line	Time series	Global	Daily	1km	2010	2

(1) : for R&D over Europe/France
(2) : for operational application. Today, the model resolution is 0.25°. For each 0.25° grid-cell, the products should be delivered for several land cover types (TbD).

Water

Water Parameters	NRT / Off-line?	Time coverage	Spatial coverage	Time resolution	Spatial resolution	Availability Date	Priority Order
Soil Moisture	NRT and off-line	Time series as long as possible	global	2-3 days (A)	0.5° (A)	2008	1
Fraction of Snow	NRT and off-line			daily	km	2010	1
Freeze / Thaw	NRT and off-line			daily	km	2010	1
Precipitation (*)	NRT and off-line	Time series as long as possible	global	daily	0.25°	2008	1

(A): ASCAT/MetOP product: ASCAT time and space resolution
(*): precipitation fields as accurate as possible are required

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Conclusion: towards operations

- 2008: ECMWF should be able to run a simple land carbon operational system
  - carbon fluxes at the global scale (25 km resolution)
  - covers the needs of GEMS

- GEOLAND-2:
  - implementation of NRT EO data assimilation
  - use of NRT in situ data for CAL/VAL
  - R&D on joint assimilation of EO and in situ data
  - R&D on integration of inventories
  - R&D on medium resolution (1-10 km)