Steinhausen: Pionier der adjungierten Modellierung

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Sensitivity of the Seasonal Cycle of CO_2 at Remote Monitoring Stations With Respect to Seasonal Surface Exchange Fluxes Determined With the Adjoint of an Atmospheric Transport Model

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Abstract. The adjoint model to a global three-dimensional atmospheric transport model can be used to efficiently perform a sensitivity analysis, i.e. the computation of the partial derivatives of a particular model output feature with respect to many control variables. We demonstrate this approach by investigating the dependence of the magnitude of the modeled seasonal cycle of CO_2 at remote monitoring stations with respect to the magnitudes of the seasonal cycle of the net CO_2 surface fluxes prescribed from a simple diagnostic terrestrial biosphere model. The technique results in global maps of those source regions that predominately influence the magnitude of the seasonal cycle at the different monitoring stations. ©1997 Elsevier Science Ltd

tion. However, often the inverse problem is of even greater interest: given observations of the CO_2 concentration at particular monitoring sites, what is the range of possible surface source configurations that are compatible with the data? This problem requires the application of numerical inversion techniques, such as the "synthesis inversion" (Enting et al., 1995) or the adjoint technique (Steinhausen, 1979; Marchuk, 1995).

Here we demonstrate an application of the adjoint model to a three-dimensional transport model as tool for sensitivity analysis. The adjoint model can efficiently compute the partial derivatives of an observational feature

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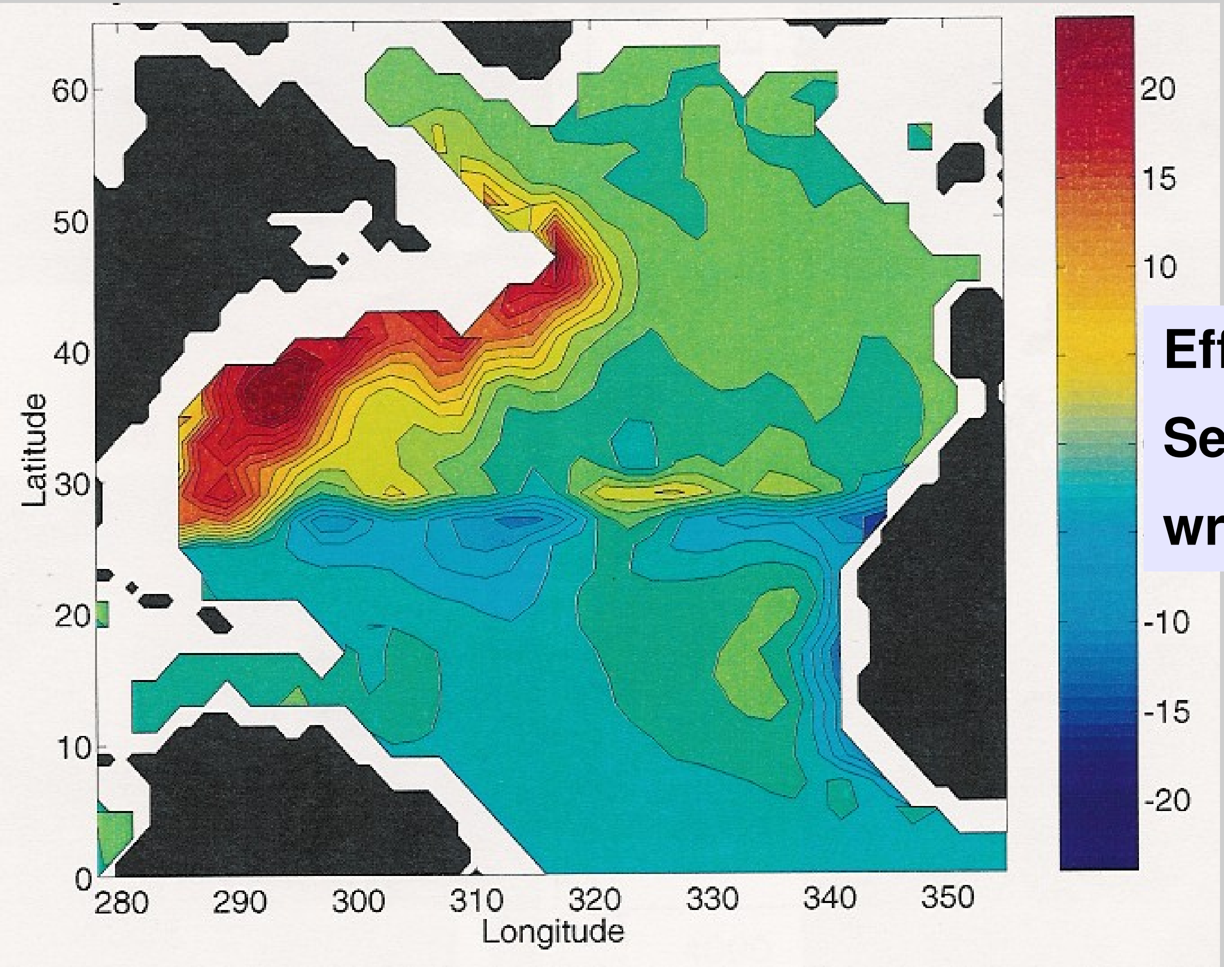
Das Schmuckstueck

Adjoints for Sensitivity Analysis



Efficient Tool for providing Sensitivity of few target values wrt many input values

Figure: Matrotzke et al. (1999)

Parameter estimation and uncertainty propagation

Powerful tool for parameter estimation (assimilation)and uncertainty propagation

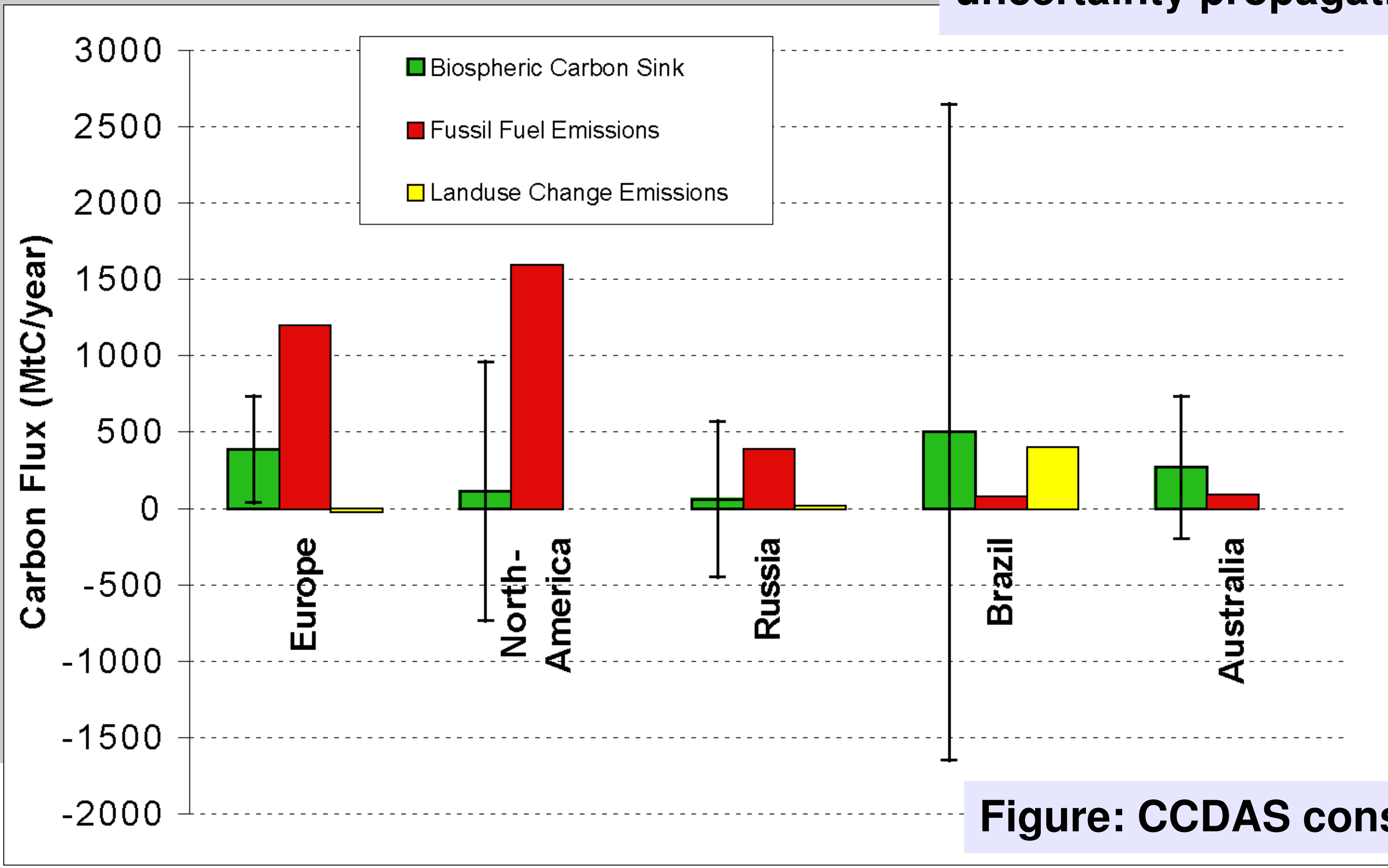
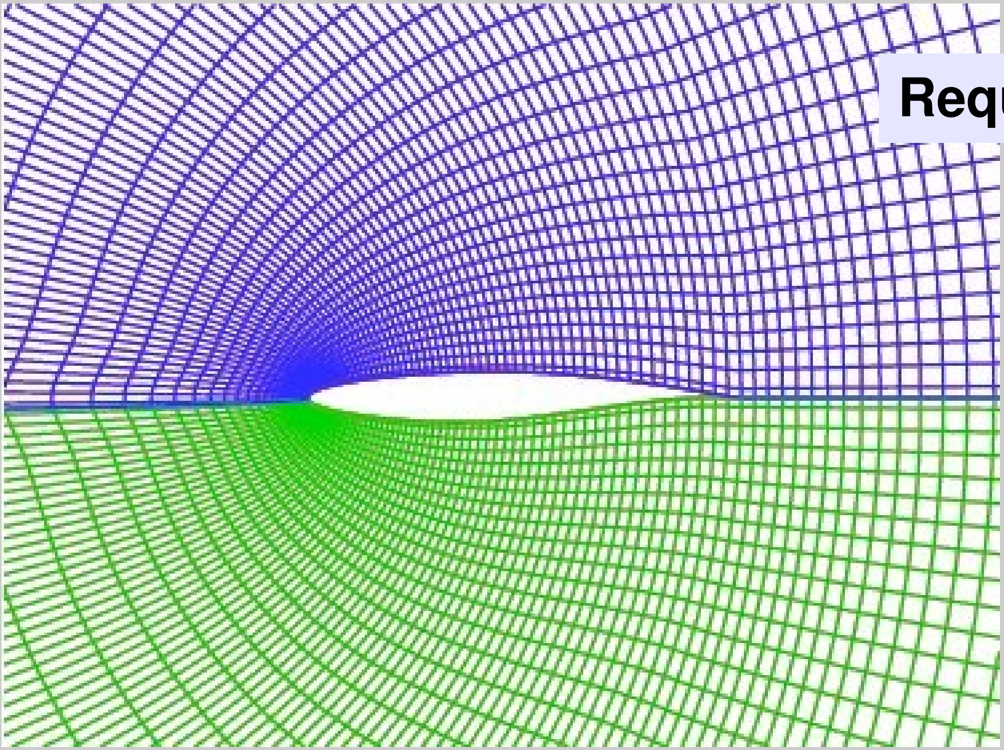


Figure: CCDAS consortium


dennree
Apfel-
Saft
Kleefeld
Milch
BIO

No photo of ECCO consortium available!

Shape Optimisation / Design



Requires sensitivities of grid

Figure: Gauger (2004)

Similar:

Sensitivities wrt to bottom topography by Losch and Heimbach (2006)

Hedge Sensitivities

$$\frac{\partial V}{\partial t} + rS\frac{\partial V}{\partial S} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} = rV$$

Black and Scholes (1973)

V: value of option
S: spot price of underlying
: volatility

S	*V*	*Delta=dV/dS*	*Gamma=d2V/dS2*	*speed=dGamma/dS*	*Vega=dV/dsigma*	*d2V/dSdsigma*	*dGamma/dsigma*
30	0.09	0.05	0.03	0.01	2.32	0.96	0.23
33	0.41	0.17	0.06	0.01	6.01	1.39	0.00
36	1.22	0.37	0.07	0.00	9.65	0.88	-0.32
39	2.68	0.60	0.07	0.00	10.68	-0.20	-0.34
42	4.76	0.78	0.05	-0.01	8.81	-0.93	-0.13
45	7.29	0.90	0.03	-0.01	5.76	-1.01	0.06
48	10.08	0.96	0.01	0.00	3.12	-0.72	0.11
51	12.99	0.98	0.01	0.00	1.45	-0.40	0.09
54	15.96	0.99	0.00	0.00	0.60	-0.19	0.05

Summary

Questions:

- Was hat's gebracht?
- Korrumpiert?

Other companies founded by former colleagues:

- http://mikan.nc and NC Raceboats
- http://georgbarzel.de
- http://oasys-research.de

Cast

Olivier Talagrand
as S.W. Steinhausen

Andre Kostolany
as late Steinhausen