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kick-off meeting
4/11/10

Development of statistical methods

- Analysis of climate variability
 - Methods : geostatistics | EOF | spectral | changepoint
 - Applications : interdecadal variability | data homogenization | climate change detection

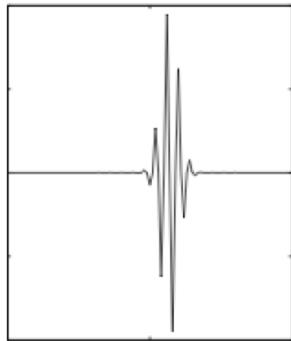
- Quantification of model uncertainty
 - Methods : uncertainty propagation | ensemble analysis
 - Applications : climate sensitivity and feedbacks | present state and future projections

- Design of climate services for the insurance sector
 - Methods : image analysis | statistical inference | metamodeling
 - Applications : teledetection of hail damages | evaluation of drought

Illustration 1 : blending EOFs and spectral analysis for interdecadal variability detection

- work in progress with C. Vera and G. Silvestri

Method outline :
wavelets
x principal components



Results on SSTs

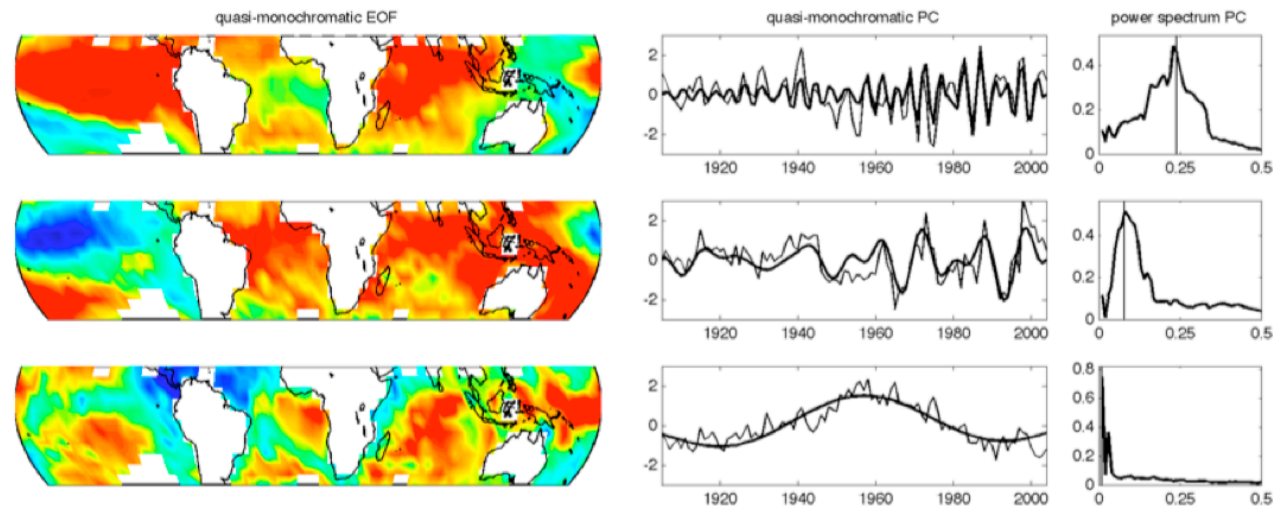
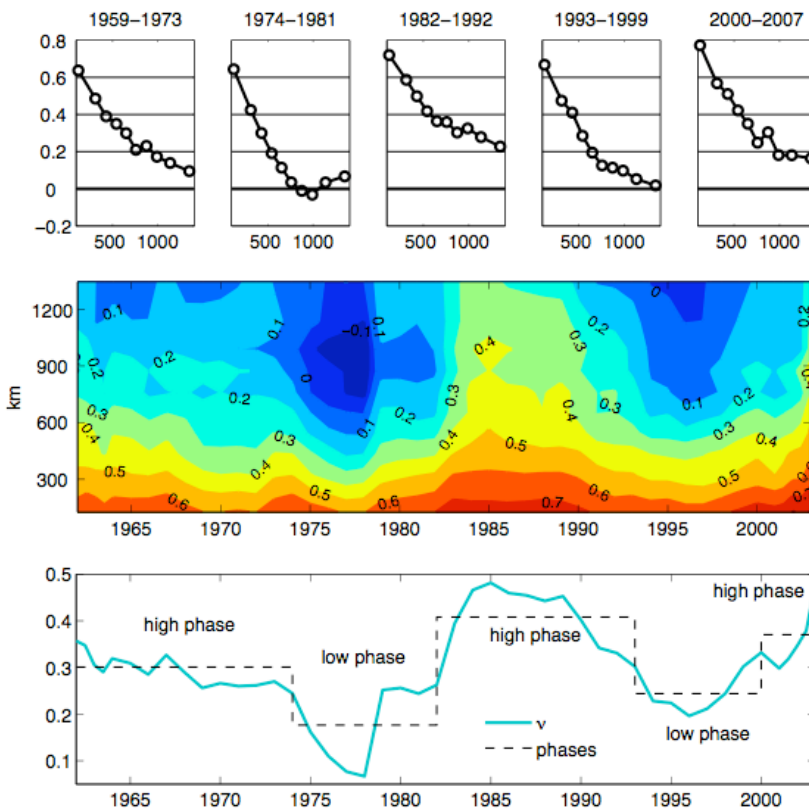


Illustration 2 : using geostatistics for interdecadal variability detection

- Hannart & Barros 2010 (submitted)

Variability of the correlogram



Power spectrum and comparisons

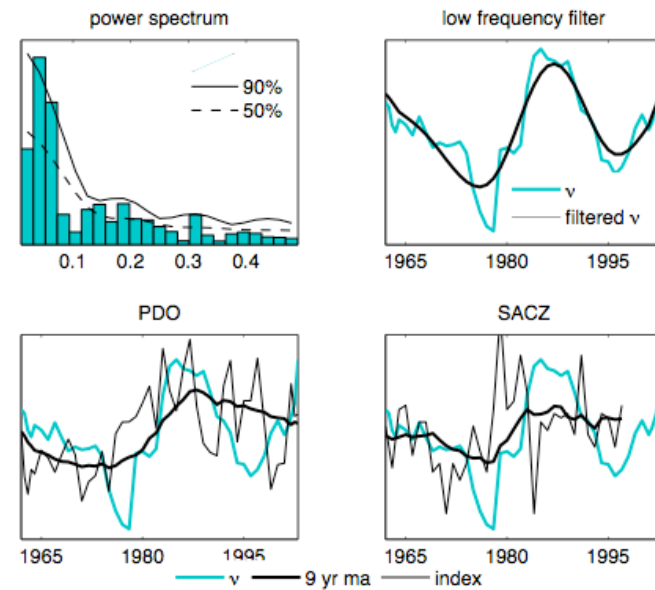


Illustration 3 : detecting changepoints for homogenization

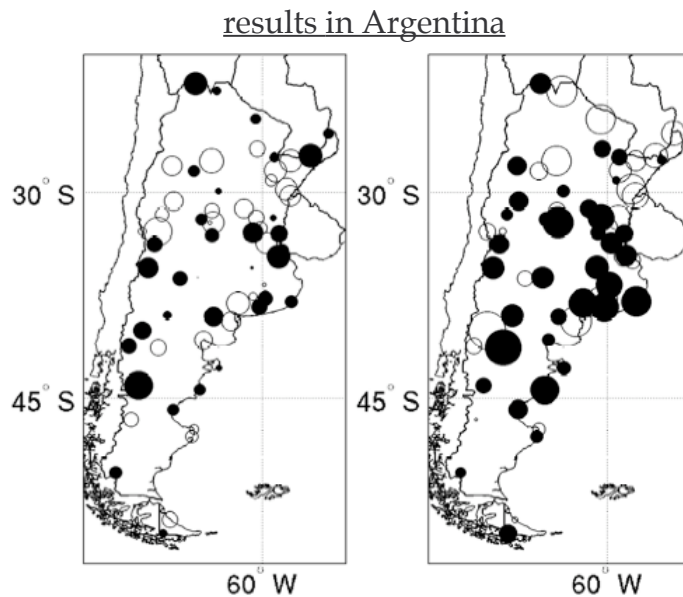
- Hannart & Naveau, 2009

$$\tilde{\mathcal{C}}(y) = \mathcal{C}(y; \hat{\kappa} = 1, \hat{\tau}) - \mathcal{C}(y; \hat{\kappa} = 0, \hat{\tau})$$

$$\tilde{\rho}(y | x) \simeq 1 - \bar{\omega}(n_y) \cdot \omega^*(n_y, y) \cdot (1 + \omega_1(h, y))$$

$$y^* = \operatorname{argmax}_{y \in \mathcal{X}} \bar{\omega}(n_y) \cdot \omega^*(n_y, y) \cdot (1 + \omega_1(h, y))$$

$$\hat{\tau}_{y^*} = \operatorname{argmax}_t \omega_1(t | y^*, h)$$



method outline

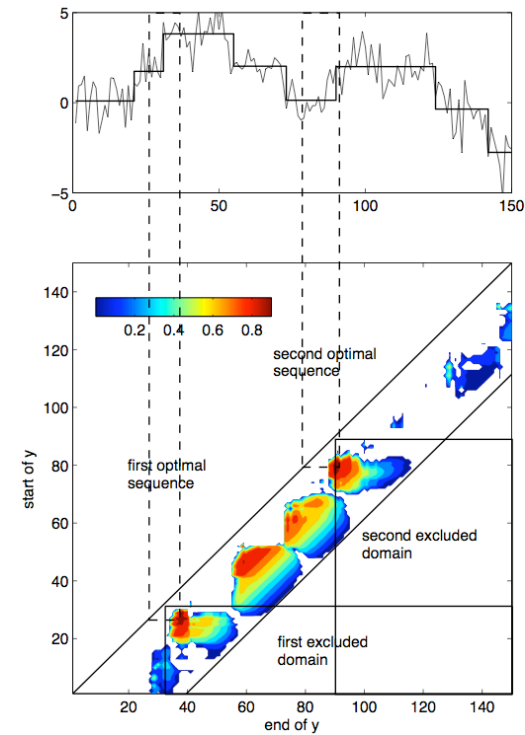
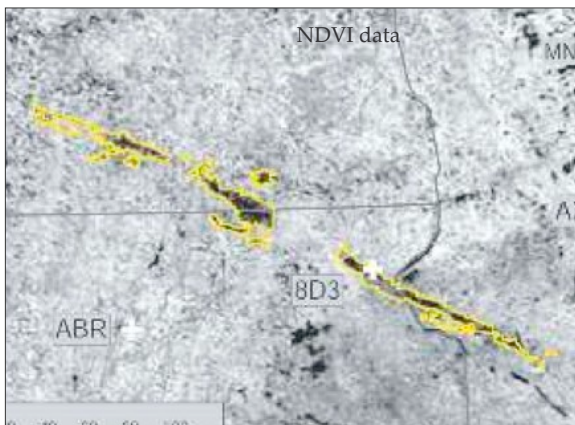


Illustration 4 : teledetecting hail damages

- Work in progress with P. Salio

Kansas, USA
(Parker et al., 2005)



Argentinean Pampa

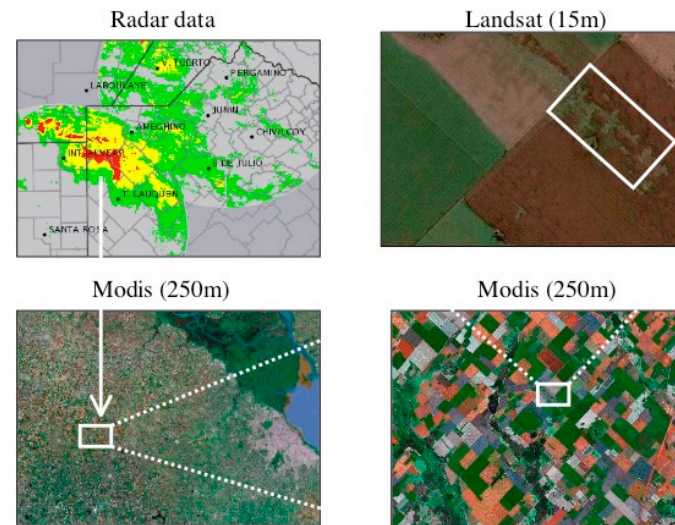
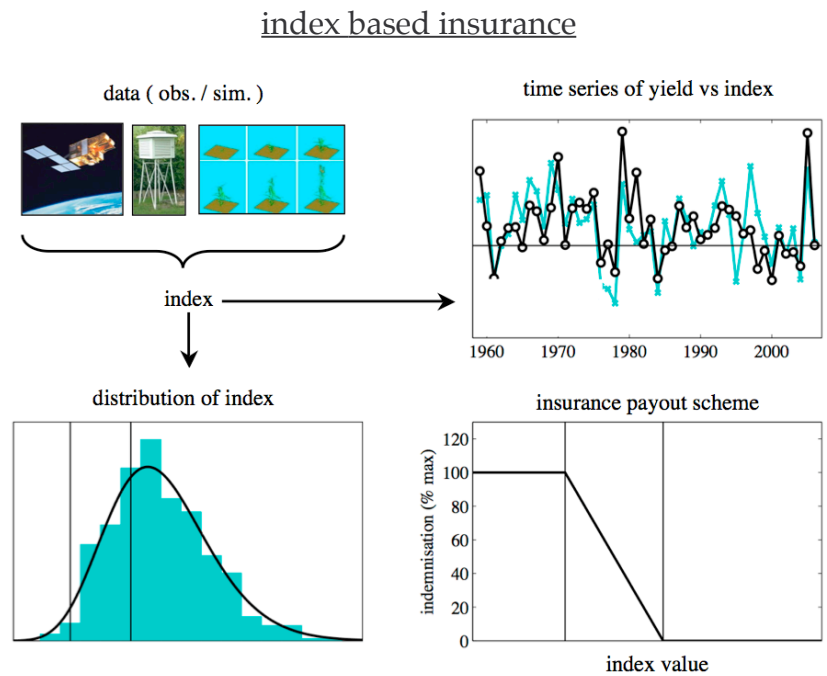
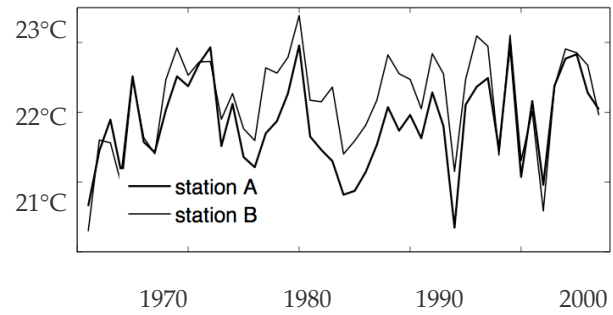


Illustration 5 : designing index-based insurance schemes

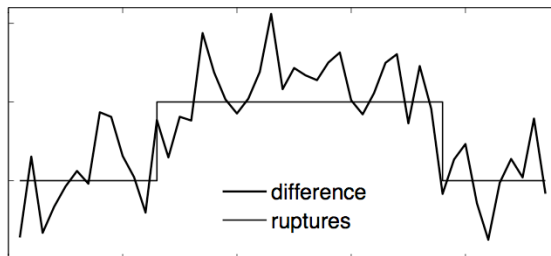
- Prospective work with C. Meñendez and colleagues



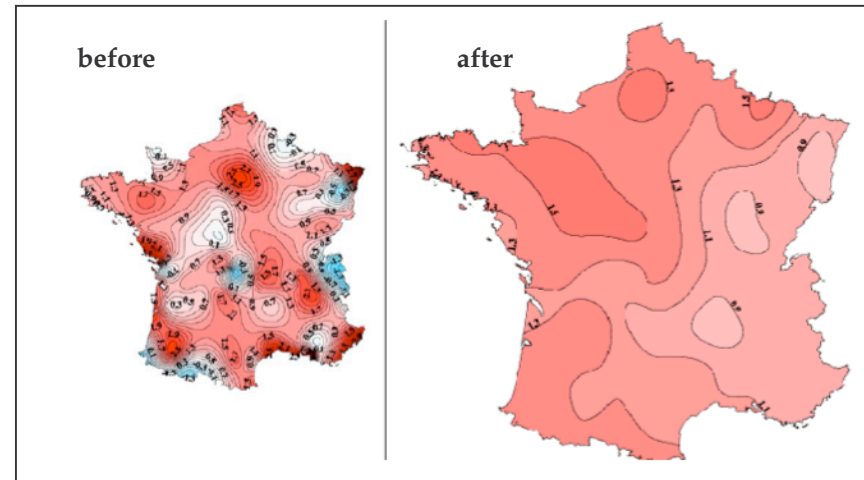
max temperature
at two neighbouring stations



difference



temperature trends



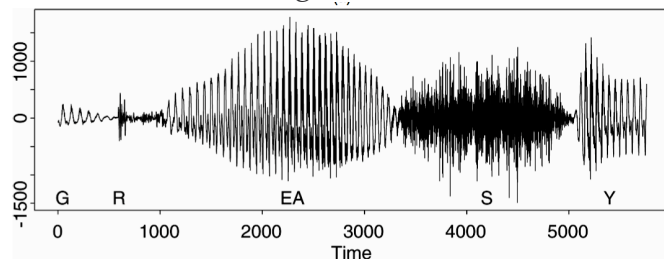
Source : Météo France

Changepoint detection methods from other fields...

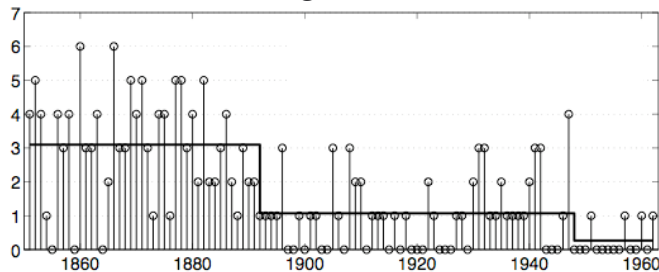
lena contours



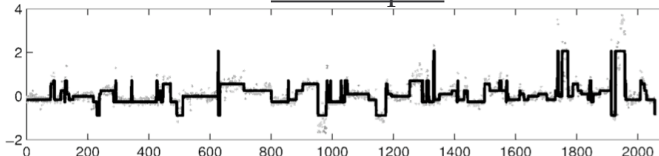
recording of human voice



mining disasters US



ADN copies



references

- Zhao X. (2005)
- Perreault, L., E. Parent, J. Bernier, and B. Bobée (2000)
- Davis, A. R., Lee, T. C. M. and Rodriguez-Yam, G. A. (2006)
- Raftery, A. E., and Akman, V. E. (1986)
- Zhang, N. R., and Siegmund, D. O. (2007)
- Basseville, M., and Nikiforov, I. V. (1996)