

This visit was fundamentally aimed at establishing a collaborative research plan between the visitor, Fabio D'Andrea, and the host group of prof. R. Garcia-Herrera.

This plan was established at the margin of other already funded research projects, e.g. the project CHAMPION on heat waves funded by the French ANR, or the CIRCE project funded by the EC FP6. It concerns the occurrence of extreme events of heat in Europe and the Mediterranean basin, and in general in the continental midlatitudes.

Although they obviously have less disastrous effects than their summer counterparts, winter heat waves can be as important in amplitude. One example is the winter of 2006/2007 in Europe, during which the mean surface temperature anomaly was as high as three times its standard deviation.

Recent work (Yiou et al 2007, Geophys. Res. Lett.) suggested that winter heatwaves are not simply the effect of internal atmospheric variability, but appear to have been amplified by another phenomenon, possibly a local feedback. This phenomenon appears to have become more and more effective in the last two/three decades.

The first possible candidate for such a phenomenon is the radical change of albedo and hence of the surface radiative balance due to the reduction of fog and mist over midlatitude continents. This is possibly linked to the increase of large scale temperature due to global change, and to the reduction of aerosol and particulate urban pollution.

After drafting a detailed plan, it was proposed to a student, Paul Aizpurua Velasco, who is now beginning his PhD program. The remainder of the visit was dedicated to jump-start his research by training him to reproduce the results of the article Yiou et al (2007 GRL). In the future, the collaboration will remain active. A visit of a few months of Paul Aizpurua to LMD in Paris is expected by fall 2009.

The plan for the research is as follows:

1) Question: how much are winter heatwaves due to atmospheric variability? How much to local feedbacks?

Repeat the analysis of Yiou et al (2007 GRL), but for different regions of Europe and the Mediterranean basin and at different times.

2) Question: do climate models reproduce the findings of part 1?

Is there an underestimation of the surface temperature increase in winter?

Analyse the outputs of Scenario models from the IPCC data repository.

3) Question: is the reduction of fog responsible for the increase of surface winter temperature?

Use a high definition vertical model of the stratified night boundary layer.

Point 1) requires data that are available in the framework of the CIRCE project as well as from the national weather services. The procedure for obtaining the data has already stated.

P. Yiou, R. Vautard, and P. Naveau, 2007: Inconsistency between atmospheric dynamics and temperatures during the exceptional 2006/2007 fall/winter and recent warming in Europe. *Geophysical Research Letters (GRL)* paper 10.1029/2007GL031981, 2007.