**Title:** Study of Heavy Precipitation Events during HyMeX SOP1 – Characteristics, transport and role of water vapour patterns

The Laboratoire Atmosphère Milieux Observations Spatiales (LATMOS) and Centre National de Recherches Météorologiques (CNRM) offer an 18-month post-doctoral position to work on process studies aiming to advance knowledge on the interaction between deep convection and the ambient flow in the northwestern Mediterranean basin. The post-doctoral position is funded through the ANR MUltiscale process Studies of Intense Convective precipitation events in Mediterranean (MUSIC) project, that contributes to the HyMeX Program (http://www.hymex.org/). The position is opened as of 15 January 2015.

**Context:**
The Mediterranean region is frequently affected by heavy precipitation that produces flash-floods and landslides. They are the most damaging natural risk in Mediterranean that costs each year several billions euros of damages and fatalities. Mesoscale convective systems that stay over the same area during several hours are the main responsible for high rainfall totals that produce flash-flooding. These meteorological phenomena result from complex multiscale interactions between the ambient flow, topography and deep atmospheric convection that make difficult the forecast of the precise timing and location of the intense convective precipitation.

The overarching objective of the MUSIC project is to provide a better understanding and modelling of intense convective precipitation events in Mediterranean in order to improve their forecast by state-of-art kilometric and sub-kilometric scale Numerical Weather Prediction (NWP) models. The project strongly relies on the observations collected during the HyMeX SOP1 field campaign that took place in northwestern Mediterranean (France, Italy, Spain) from 5 Sep. to 6 Nov. 2012. This major field campaign provides a novel and unique dataset of observations of the convective systems as well as of the ambient flow over the northwestern Mediterranean. The project will make use of the novel capabilities of Large Grid simulations (LGS) to explicitly resolve the multiscale interactions between convective and larger scale processes leading to heavy precipitation events in order to progress in their understanding.

**Description of work:**
The Post-Doc will contribute to the collaborative work between LATMOS and GAME that includes (i) verification of model(s) capability to accurately predict/simulate the variability of water vapour in the lower troposphere at the scale of the Mediterranean Basin in pre-convective conditions using SOP1 observations, and (ii) characterisation of the origin and transport patterns of moisture inflow feeding into the convective systems occurring during the IOPs, using a combination of simulation and observations (in situ and remote sensing).

The main objective of the post-doc is to study the multiscale interactions between ambient flow and deep convection that governed the heavy precipitation events (HPEs) observed during the SOP1 based on model simulations and HyMeX SOP1 observations. Fine-scale numerical simulations of HPEs with the MesoNH model at kilometric and sub-kilometric resolution will be used to analyse the IOPs of interest, i.e. those for which convection formed over sea or for systems affecting a large part of the SOP1 domain for instance (IOP6, IOP13, IOP15b, IOP16, see http://sop.hymex.org/ for a description of the IOPs).

The MesoNH simulations of the IOPs of interest will be validated with respect to the formation and life cycle of the HPEs. Besides evaluation against satellite brightness temperature, classical objective scores will be used to assess the simulated surface rainfall amounts using the very-high density raingauge network data available in the HyMeX database. Furthermore, the simulated ambient flow will be also evaluated, comparing the numerical results against HyMeX SOP1 observations (radiosoundings, lidar, GPS, pressurized boundary layer balloons, in-situ meteorological measurements from ATR42 research flights…). Diagnostic tools available in MesoNH (lagrangian trajectories, budgets,…) will allow to characterize the low-level circulation organization over the Sea, as well as to identify the sources of lifting for deep convection. The analysis will focus on the sensitivity and the interactions between the convective processes diagnosed and the ambient flow. Special attention will also be paid to characterize the origin of the water vapour feeding deep convection and its modifications along its path and by convection itself comparing simulated water vapour budgets to lidar and GPS observations.

**Supervision team:** The work will be conducted under the main supervision of Cyrille Flamant from LATMOS[1], and Véronique Ducrocq & Fanny Duffourg from CNRM-GAME[2]. The work will be performed at LATMOS in Paris (Campus of the Université Pierre et Marie Curie), with frequent visits to CNRM-GAME in Toulouse, with a schedule to be discussed.

[1]**Laboratoire Atmosphères, Milieux, Observations Spatiales** (http://www.latmos.ipsl.fr/)
[2]**Centre National de Recherches Météorologiques** (http://www.cnrm-game.fr/gmme/)

**Experience:** The applicant should have a PhD in atmospheric or environmental sciences and s/he should speak English fluently. Experience in mesoscale modelling would represent considerable additional skills. S/he should also have experience with handling large datasets. The applicant publication record should show a majority of papers published in English in top ranking journals.

**Duration and salary:** The post-doctorate will be recruited for 18 months with a net monthly salary around 2000 euros, commensurate with experience. This includes social services and health insurance.

**Contact for applications:** Applications should include a CV, a statement of research interests and the names of at least two referees including e-mail addresses and telephone numbers.

Applications should be submitted by e-mail to Cyrille Flamant (cyrille.flamant@latmos.ipsl.fr) and Véronique Ducrocq (veronique.ducrocq@meteo.fr) before 15 October 2014.