

Evaluation and Inter-comparison of mesoscale models on the ESCOMPTE pre-campaign (Summer 2000): Atmospheric flow simulation and passive tracer dispersion

A contribution to subproject SATURN

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Introduction

A mesoscale model inter-comparison has been organized that relates to the ESCOMPTE pre-campaign organized and conducted by French institutions in summer 2000. The scope of the exercise is to assess the modeling capacity to reproduce the circulation at the mesoscale and the dispersion of a passive tracer released in the Marseilles region. The participants to the exercise are international organizations and universities currently involved in the development and application of mesoscale circulation models. The background of this exercise is the decision of the ESCOMPTE organisers to make the pre-campaign data available to the SATURN community.

Rationale

The models that take part to the exercise are asked to simulate the circulation over the Marseilles region for a specific IOP of the ESCOMPTE pre-campaign.

All participating groups are left free to choose:

- the mesoscale model to be used
- the large scale model to determine boundary and initial conditions
- domain size
- resolution
- topography
- surface characteristics
- nesting approach
- any other model configuration required for the simulation

The groups are asked to provide time series of meteorological variables at specific locations for a specific time period as well as vertical profiles on a regular vertical grid defined a priori. The locations at which the model results are requested are mainly locations where the data are available. The participants may access the ESCOMPTE database through the official site from which they have the possibility to extract information on the measurements if requested to initialize their models. The comparison of the results at locations will give a global assessment of the model capacity to reproduce the flow, and an estimate of the model uncertainty.

The choice to leave the models free to set up the case rather than imposing a common general circulation or model configuration will allow the participants to give the technical judgment on the case study that is most appropriate to the modeling system used. As far as the tracer

dispersion case is concerned no experimental data are available. In this case a model vs model comparison is performed. Some locations of the Marseilles region are selected that act as virtual release points or areas. For each of the locations an emission rate, release time and duration is provided to the participants who are asked to determine the concentration fields of the tracers over a specific time period.

Information on the case study and exercise

The time period and all technical specifications for the simulations are presented at http://rtmod.ei.jrc.it/escomppte_int. The web location was open to the public on July 15th. On October 2nd a meeting was held in Toulouse with all the participating institutes to discuss the technical details of the case presented.

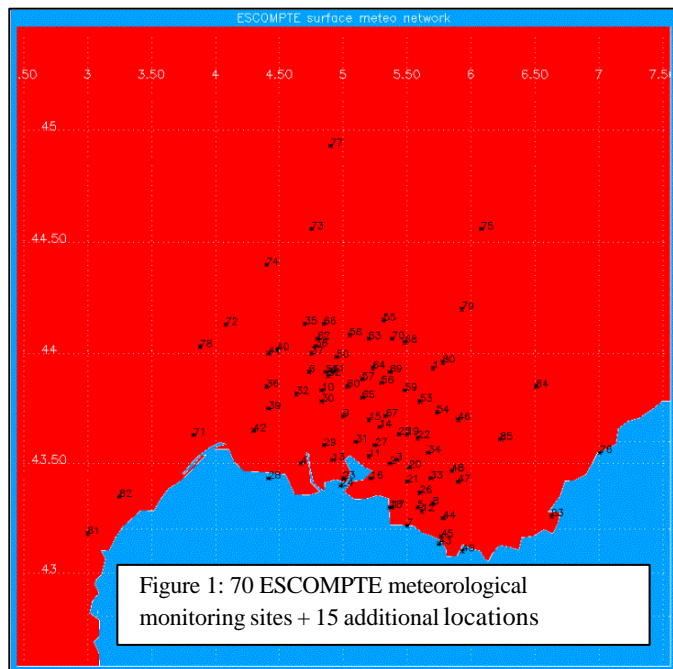
Participants

At present the institutes taking part to the exercise with different meteorological tools are: CIEMAT (S), CNR Turin (I), E.Centrale Nantes (F), IPSL/LMD (F), IPSL/SA (F), JRC/IES(I), Laboratoire d'Aerologie / OMP (F), LISA (F), METEOFRACTANCE (F), NCSR Demokritos (G), RIVM (NL), Un. B. Pascal (F), Un. Aristotle Thessaloniki (G), Un. Aveiro (P), Un. Catholique de Louvain (B), VITO (B).

Technical aspects of the model evaluation

For the time window of 2 days selected (30/6/00 to 01/07/00), the model results will be compared on the following cases:

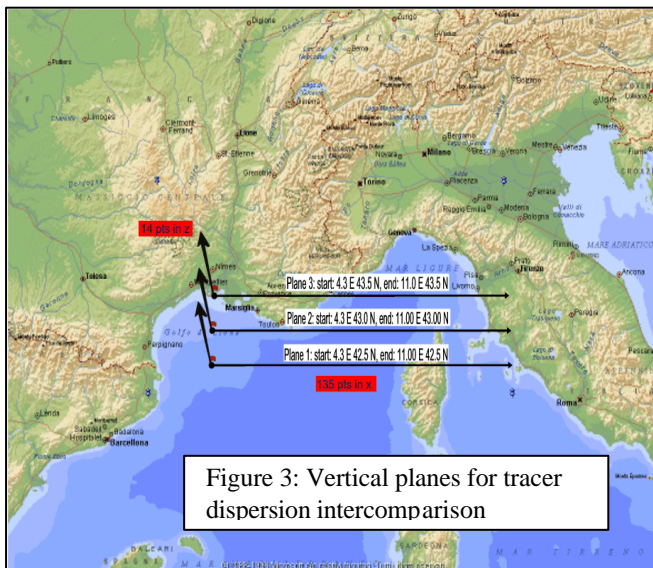
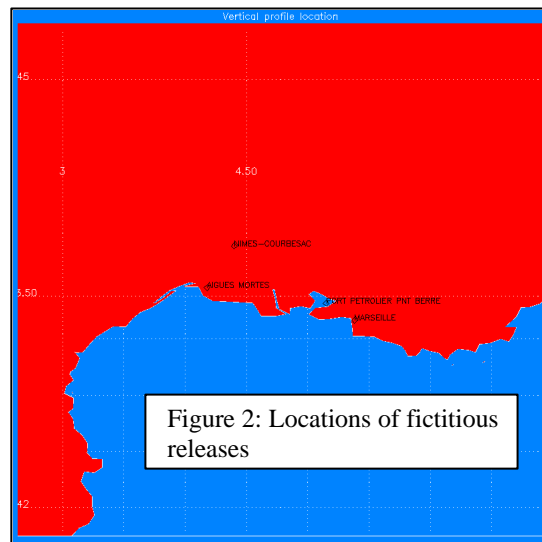
Time evolution of meteorological and temperature field at surface. In this case model results on wind and temperature are compared with the data collected at 70 ESCOMPTE stations (Figure 1). Another 15 locations have been added to this list where no data are available but that give a larger coverage of the area. At those locations models will be intercompared. Boundary layer height calculated with three different methods are also requested to the modeling groups. Namely the BLM height scheme present in the model, the one obtained on the basis of the virtual temperature profile and the one based on the gradient Richardson number.



Vertical structure: At 25 locations the vertical distribution of wind and temperature at 14 vertical levels (from 0m to 3000 m a.g.) is analysed.

Analysis along flight legs: the paths of two aircraft diploid during the experimental campaign are given to the participants. The results of the models relating to wind and temperature along the flight leg are then compared with the data collected by the aircraft.

Tracer dispersion: the participants are asked to simulate fictitious releases of a passive tracer from 4 points (Figure 2). Surface concentration and vertically integrated concentration calculated over a time span of 48 hours are then intercompared. Other than in the horizontal concentration field, the model results are compared also on 3 vertical planes (Figure 3). As it shown by the figure, the domain selected is larger than a mesoscale one. The choice of such a domain size was due to the weather condition present during the time window selected. A persistent Northerly flow was observed that would take any tracer out of a mesoscale domain within few hours. The selection of such a domain size allows the analysis of the dispersion evolution over a longer period of time.



Subgrid structure: Surface heat forcing is a crucial parameter in determining the circulation. The participating groups are therefore asked to submit sensible a latent heat flux at surface over a predefined domain.

Aims for the coming year

The exercise officially started on October 2nd. The groups taking part are expected to submit their results before the end of 2001. The results of the comparison will be made public on the exercise web location next Spring.