# Euromech 266: Airflow and Turbulence in Complex Terrain

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The Colloquium was held in Bologna from 27 to 29 August; it was hosted by the Istituto FISBAT of CNR (namely, the Institute for the study of physics and chemistry of the upper and lower atmosphere).

Broadly, the Colloquium showed that there have been some significant developments since 1983 (when there was a previous Colloquium on the same topic, reported in J.Fluid Mech., 142, 1984) in theoretical analysis, computational modelling and field experiments.There were presentations of new kinds of measurement, new phenomena and the improved quantification and understanding of well known phenomenas. For example, computation and wind-tunnel experiments of flows over undulating surfaces whether driven by buoyancy forces or by a cross flow produce secondary flows with vorticity parallel to and perpendicular to the undulations (in the latter case it is consistant with the prediction that Langmuir cells may be forced in these flows). The magnitude of the net drag force on undulating surface in neutrally stratified turbulent flows now appears to be well established from several different models, computations and experiments, and the relative magnitudes of a number of contributing mechanisms has been evaluated. The role of Coriolis accelerations (f) in atmospheric flow over simple terrain features (length scale L) at the mesoscale (of order 30km upwards) is now better understood; for hilly terrain rising on a flat plain the Rossby radius (R=hN/f) is the relevent length scale (where N is the buoyancy frequency), but in other situations such as the channelling down the Rhine valley only the Coriolis parameter may control the turning of the wind on the scale of the terrain.

The recent field measurements by doppler-sodar, (which are installed in several French power stations), produce useful data for comparing with computational models, but these results also emphasise the need to solve the theoretical question of how best to combine model calculations and redundant information about the flow field derived from many measurements. The task of modelling these air flows has improved in accuracy and in economy to the extent that they can be effectively combined with models of dispersion of pollutants and models of microphysics and chemical processes in polluted clouds over hills.

The Colloquium was followed by an ERCOFTAC Workshop devoted to the discussion and comparison of computer software for atmospheric boundary layer modelling.
Almost all the participants at the Colloquium also attended the Workshop, which that resulted in a further opportunity to discuss the scientific results of the Colloquium. The Workshop also agreed about some lines of development of the models and about the choice of a few data sets to be used as benchmarks for

Some of the computer software presented was suitable for use on small computers. They were demonstrated with the facilities of FISBAT and explained intensively (i.e. different parametrizations and model outputs compared on request). Other computational codes were presented and discussed, without local demonstrations. Two or more groups with the same or similar codes were able to compare the results.

The number of participants to the Colloquium was 35; among them 17 from Italy (6 from the host Institute), 4 from France, 3 from UK and from Portugal, 2 from Spain, 1 from West Germany, Switzerland, Czekoslovakia, Canada, China and USA.

Financial support was given by CNR, the Italian Research Council, to cover the organization expenses and to support travel expenses of some participants. Actually three participants asked for support, and it was possible to pay travel ticket (for two) and hotel expenses (for three). No participation fee was asked, and live expenses were supported by the participants; a contribution (of 25.000 Italian Lire) was asked for the Conference dinner, as partial cover of the real cost.

Enclosed here is the collection of the abstracts, the programme of both the Colloquium and the Workshop circulated at the beginning of the meeting and the programme actually realized, and a list of participants.

Finally, we consider that the Colloquium was fruitful, in the sense that new scientific trends have been outlined; the coupling with the ERCOFTAC Workshop seems also of benefit, leading in this case to a wider participation and to a broader horizon of discussion (we refer mainly to the intense interlacing between theoretical and practical aspects of many of these airflow problems).

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