Geophysical Research Abstracts,
Vol. 11, EGU2009-12007, 2009
EGU General Assembly 2009

Application of the transilient turbulence parameterization to the simulation of wind gust in a Regional Climate Model

S. Goyette

University of Geneva, Pôle de l'Environnement, Climatic Change and Climate Impacts, Geneva, Switzerland (stephane.goyette@unige.ch, 41 (0)22 379 07 57)

This paper reports on the development of a parameterization for subgrid-scale momentum transfer in the planetary boundary layer that allows a better reproduction of windgusts during windstorms. Wind extremes impact heavily upon the natural environment and on human infrastructures so it is important that numerical models developed for weather prediction as well as these for climate simulations reproduce well strong winds at the surface. Work is underway to implement and validate an alternate momentum transfer scheme for the surface boundary layer in numerical models following the "transilience turbulence theory" or "T-theory" based on the ideas of Stull (1984) developed initially for pollutant dispersion, boundary layer and cloud entrainment studies. The framework for turbulent transport is developed that allows the eddy-like mixing of fluid element across a range of layers unlike the classical K-theory allowing only adjacent layer exchanges of momentum, heat and moisture. The practical implications is that the turbulence mixing can occur between grid points separated in the vertical rather than between only neighbouring grid points as modelled in the K-theory. This study is part of a continuing development of parameterisation schemes for wind gust initiated by Brasseur (2001) using simulated GCM/RCM outputs and by Goyette et al. (2003) who implemented a similar scheme in a RCM to diagnose gusts on the basis of surface characteristics, TKE and other flow fields in the PBL. This numerical scheme was not coupled to the circulation in the PBL, however. This study is thus an attempt to integrate the gusty nature of the winds to the PBL in the numerical simulation of windstorms and validate it to the December 1999 Lothar and the February 1990 Vivian storms.

References

Brasseur, O., 2001: Development and Application of a Physical Approach to Estimating Wind Gusts, Mon. Wea. Rev., 129, 5-25.

Goyette, S., O. Brasseur, and M. Beniston, 2003 : Application of a new wind gust parameterisation. Multi-scale case studies performed with the Canadian RCM. J. of Geophys. Res., 108 (D13), 4374-4390.

Stull, R. B., 1984 : Transilient turbulence theory. Part I : The concept of eddy-mixing across finite distances, J. Atmos. Sci., 41, 3351–3367.