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MMM SEMINAR *NCAR*

On the Role of Topography in the Earth-Atmosphere Exchange

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Earth-Atmosphere interaction is generally understood to take place at the surface and to be determined by the abundance of energy, matter or momentum on the one hand, and by the efficiency of turbulent exchange on the other hand. Hence the net exchange of heat, mass or momentum between the surface and the free troposphere are chiefly determined by the characteristics of the atmospheric boundary layer (exchange efficiency). In atmospheric numerical models processes related to this turbulent transport are usually parameterized (except perhaps for very high-resolution Large Eddy Simulations). For sensible heat and trace gases such as water vapour, parameterizations employed are based on our knowledge on boundary layer processes from flat and horizontally homogeneous terrain. Over complex terrain, however, exchange of heat, mass and momentum is not only controlled by turbulence alone, but also through meso-scale processes like thermally or dynamically driven meso-scale circulations. These are larger in scale than turbulence but smaller than (or comparable to) the resolution of most numerical models. Thus either they need to be parameterized (in coarse resolution models) or their interaction with turbulence needs to be known. It is worth noting, that for momentum it has long been recognized that parameterizations for turbulent exchange alone are not even sufficient to reproduce mean flow magnitudes (nothing to say about local flow patterns) and therefore additionally, gravity wave drag parameterizations have been introduced in order to take into consideration the additional drag due to the effect of subgrid-scale topography. In this contribution we hypothesize that also for the exchange of heat and mass over topographically influenced regions subgrid scale processes such as local circulations or geometrical effects may play an important role in altering the pure surface exchange due to turbulent transport. Some results from combined observational/ numerical studies will be reviewed in support of this hypothesis and possible consequences, e.g. for carbon budgeting in complex terrain will be discussed.

This seminar will be recorded and available via webcast at:
http://www.fin.ucar.edu/it/mms/fl-live.htm

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Refreshments 10:15 AM
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