

## **Group Discussions on GABLS4**

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### **1. Scientific questions in GABLS4**

#### **a) Focus on 18 May (the period of 1D modelling)**

- decoupling; how models with different ABL, radiation, and snow schemes perform?
- evolution from slightly stable to very stable stratification: role of heat flux from air to surface, radiative cooling of the air, and heat conduction in snow
- feedback mechanisms that finally prevent the growth of  $T_a - T_s$  and turn it to decrease: increasing conductive heat flux (when the temperature gradient in the upper snow layers increases) and decreasing upward LWR. What is the role of changing external forcing, if any?
- role of wind speed: the decrease of wind speed on 18 May contributes to increasing stability and, on the other hand, the decrease of wind speed in the lowermost 32 m layer is partly due to the increasing stability (decrease of downward transport of momentum). Which one is more essential?

## **b) Focus on 17 – 20 May (3D experiments)**

- all aspects in (a) above
- Mesoscale dynamics of katabatic winds: lifting over the cold air pool on the flat ice shelf. Variations of the LLJ core height: 100-200 m on 19 May, some 30 m on 20 May
- cloud radiative forcing and its interaction with SBL turbulence
- reasons for the observed wavy patterns in air temperature: trapped gravity waves?

## **c) For Dome C**

- Diurnal cycle, transitions between stable and convective boundary layer
- Interaction of turbulence, shortwave and longwave radiation, as well as heat conduction in snow
- TKE profiles

## 2. 3D experiments

- a) In addition to the role of 3D experiments in the preparations of 1D experiments, there was discussion about an extensive 3D model intercomparison study. However, as it has turned out to be difficult to organize 3D model intercomparisons with a common modelling strategy, we decided not to build a more extensive study. The following experiments are, however, planned:
- Gunilla will run COAMPS for the May 2003 period in Halley, and Dome C?
  - Eric and Laura will work to solve the remaining problems in HARMONIE runs for the same period in Halley and for the Dome C period of 25-27 November and/or 3-4 December 2009
  - Laura could possibly run HIRLAM for the Dome C period.
  - Irina can collect ECMWF operational model results for Dome C and possibly do re-run for Halley using the present model version.
  - Polar WRF –based AMPS results can be analysed (who will do?)
- b) The 3D model experiments done so far (Polar WRF and HIRLAM) will be documented by Timo, Tiina, Laura and Eric, to help in planning of the above-mentioned additional 3D experiments.
- c) All 3D experiments will serve in providing estimates for adiabatic tendencies for the 1D models. In addition, manuscript(s) will be written on the basis of the 3D experiments and their comparisons against observations.

### 3. Strategy of GABLS4 column model experiments

- a) The coordinators will provide each group with
  - the initial conditions in the atmosphere ( $T$ ,  $q$ ,  $u$ ,  $v$ ,  $w$  profiles), snow ( $T(z)$ , density, soil moisture (technically needed)), and surface ( $z_0$ ,  $zTq$ )
  - time series of geostrophic wind (or momentum advection), vertical wind?, and advection of heat and moisture at various levels.

A few initial conditions (with advection time series) will be provided so that the partners can make an ensemble of 1D simulations. Vertical resolution and time interval need to be decided.
- b) Each participating group will send the results to the coordinators (vertical profiles with a specified time interval) in certain format (to be decided).  
Requested model output: profiles (in  $z$ -coordination) of  $T$ ,  $q$ ,  $u$ ,  $v$ , pressure, density, cloud condensate, gust wind speed, radiative and turbulent fluxes; snow temperature profiles, ABL height, turbulence statistics (to be specified), else?
- c) The coordinators will do the validation of all models against observations

## 4. List of duties

- a) Phil:
  - check the turbulent fluxes observed at Halley for erroneous spikes
  - estimate the exact depths of snow temperature measurements
- b) Tiina, Laura, Timo: Analyses of geostrophic forcing (or momentum advection) at Halley,
- c) Timo, Tiina, Laura, Eric: documentation of the 3D experiments for Halley and Dome C
- d) Gunilla: COAMPS experiments for Halley (and Dome C?)
- e) Laura and Eric: HARMONIE experiments for Halley
- f) Irina: collection of ECMWF operational model results for Dome C for the same period, and possible re-run with present model version
- g) Olivier and Eric: analysis of Polar WRF –based AMPS results for Dome C for the same period
- h) Marina: 1D WRF test runs to find out the optimal starting time of Halley experiments. The problem is that we don't have observed initial profiles on 18 May 12 UTC. Test runs starting at 17 May 12 UTC (when sounding data available, but uncertainty in advection) and 17 May 21 UTC (starting from profiles based on 3D WRF, at the time when no more much uncertainty in advection, but stratification still neutral. The test runs can be continued until clouds appear on 19 May around 10 UTC.

- i) Gert-Jan: analogous test runs with the 1D Duynkerke model for Halley
- j) Eric: in the selection of the 1D period, check that the period does not include strong non-local effects on the wind profile (katabatic winds generated far away, as at Halley on 19 May)
- k) Eric, Marina and/or Gert-Jan: test runs with 1D model(s) for Dome C, analogous to (h) and (i) above
- l) Timo and Tiina: decision of prescribed advection for 1D models. To be made on the basis of Polar WRF, HIRLAM, COAMPS, and HARMONIE results (if available until x 2013).
- m) Eric: analogous decisions for Dome C
- n) Final decisions on the initial and forcing conditions for the 1D experiments in GABLS4

Ideas about time schedules?