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Evolution of Dome C location during the Quaternary from a 3D model of Antarctica evolution

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Different types of ice sheet models are necessary for the interpretation of ice core records and borehole data. Small scale models have to be used to take into account the impact of bedrock topography and of local changes of accumulation rates. However the ice sheet geometry changes with time in response to climatic forcing and this evolution cannot be simulated by small scale models because it depends on large scale processes. In the case of a drilling site located on a dome (Dome C or Dome Fuji) the fact that the dome location may have changed in the past is a crucial issue. To deal with this changing geometry it is generally accepted that the small scale model should be nested in a large scale model. However results may depend on the ability of the large scale model to reproduce the present surface topography. In this presentation, we use a 3D thermo-mechanically coupled large scale model and we investigate the possible origins of discrepancies between modelled and observed surface in the region of dome C. We propose some methods to correct the discrepancies and we present results on the evolution of the dome location and of ice thickness during the glacial-interglacial cycles covered by the EPICA record. One of our objectives is to account for ice sheet geometry changes in an ice core dating model based on inverse methods . For this purpose we also investigate the possibility of simulating these changes in geometry with a conceptual model calibrated on the 3D experiments.