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Session 8: Data assimilation and model validation

## Quantitative reconstruction of lithosphere subduction using assimilation of geophysical data

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This presentation intends to provide an answer: whether the evolution of the descending lithosphere can be restored quantitatively. To restore mantle structures and flow in the geological past, mathematical and numerical techniques for inverse retrospective problems should be used to constrain the initial (past) conditions for the temperature and velocity in the crust and mantle from present seismic, heat flow, geodetic and some other observations. The initial conditions so obtained can then be used to run forward models of lithosphere/mantle dynamics coupled with the models of surface processes in order to restore the evolution of the descending lithosphere. The basic principle of the inverse retrospective problem is to consider the initial condition as a control variable and to optimize the initial condition in order to minimize the discrepancy between the present observations and the model solution. We present a quasi-reversibility technique for geodynamic data assimilation and discuss applicability of this technique to restoration of a descending lithosphere in the presence of mantle phase transformations.