



# Outline of the European Union's ice2sea project

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# Aim



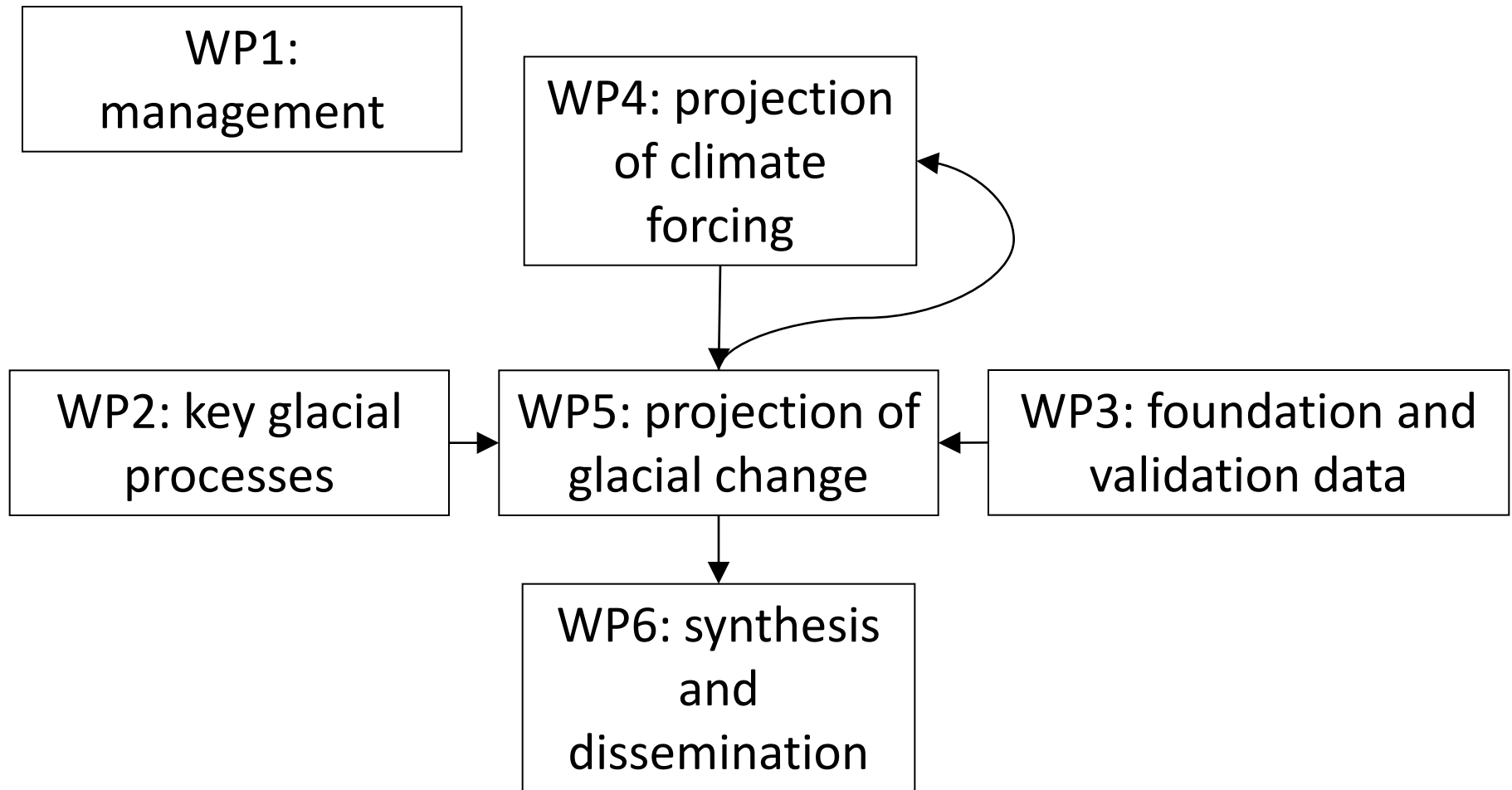
- overall aim is to provide predictions of the contribution of **ice sheets, ice caps and glaciers** to global sea level for the **next 200 years**
- the project is a response to a direct call from the EU's Framework 7 funding
- the project has 23 partners in 13 countries
- started April 2009 with most PDRAs in place Sept. 2009
- funding is €10M
- equates to rough 100 PDRA years

# Methodology

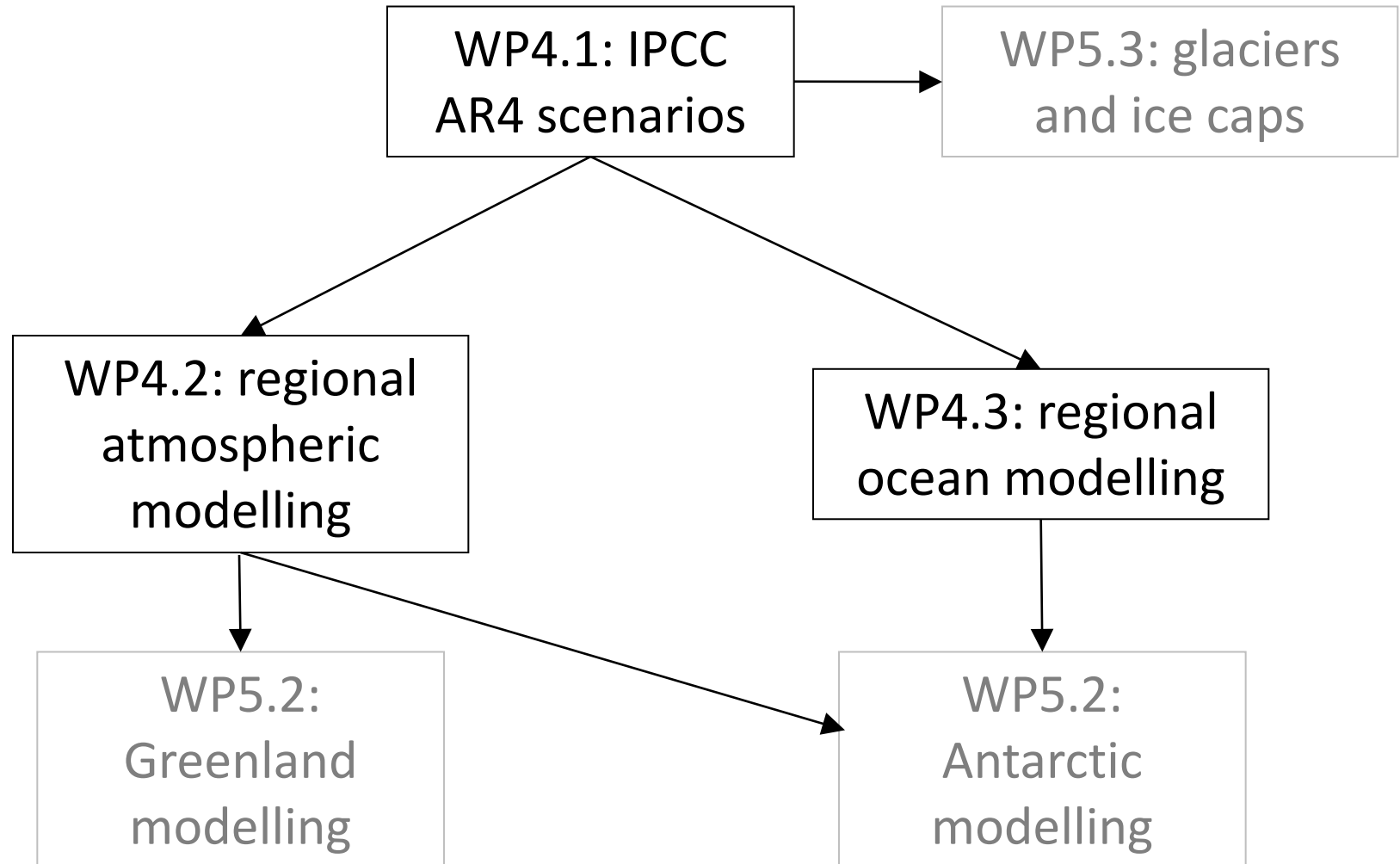


- focus on next 200 years only (policy makers' time scale)
- assuming that we can treat climate – ice interactions in an **uncoupled** way on these time scales
- global climate → regional climate → ice mass
- using IPCC Assessment Report 4 scenarios
- funded several models at each stage of the process

# Work package structure



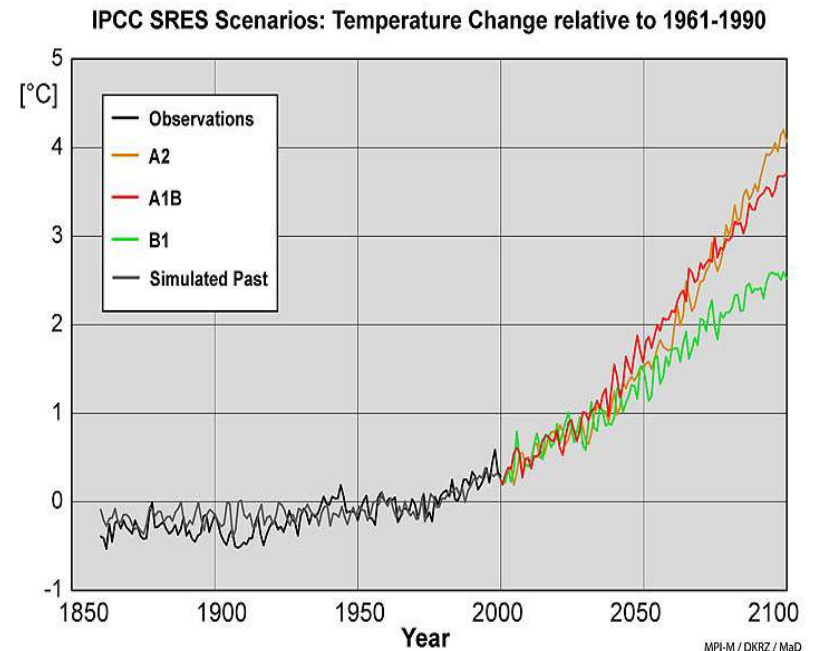
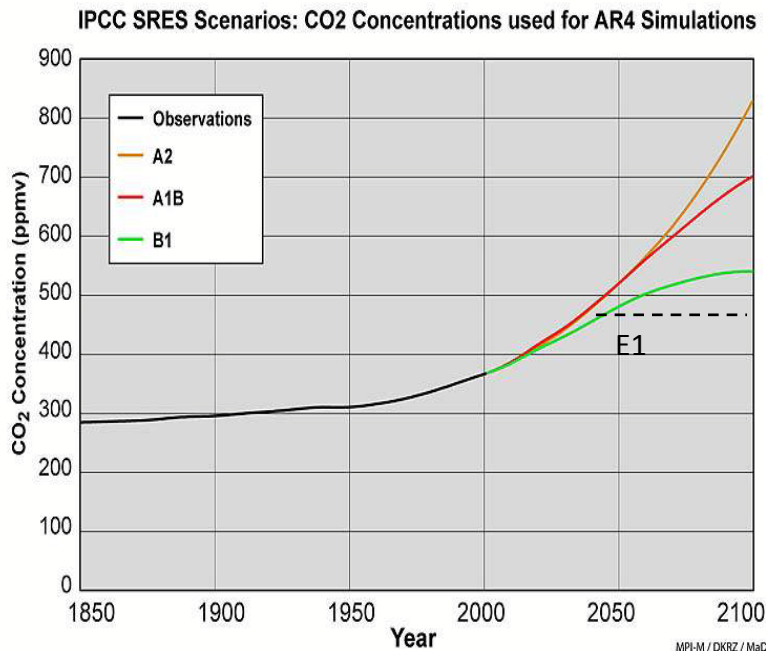
# Work package 4



# Work package 4



- use AR4 scenarios A1B and E1 for 2000 to 2200
- use HadCM3 and ECHAM4 results
- 1980-2000 with both models and ERA40



# Work package 4.2



## Regional atmosphere modelling

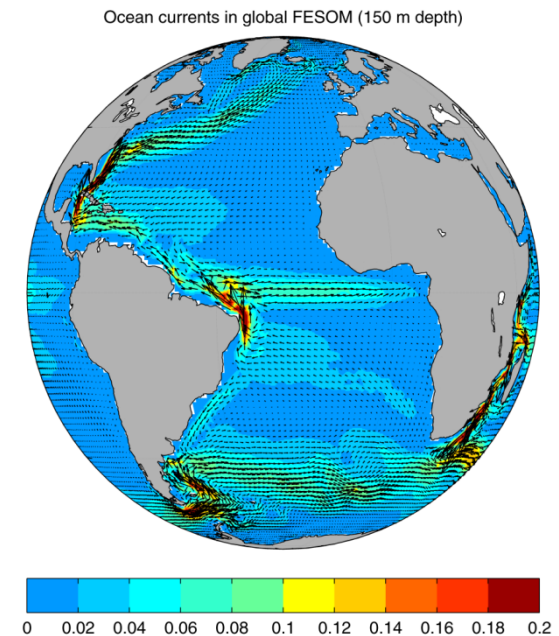
- use global results as boundary conditions (7 experiments)
- Antarctic ice sheet – van den Broeke (Utrecht) & Krinner (Grenoble)
- Greenland ice sheet – Danish Met. Institute, Gregory (Hadley Centre) & Fettweis (Liege)
- output surface mass balance terms and associated climate variables to ice sheet models
- Sept. 2010 for A1B / March 2011 for E1

# Work package 4.3



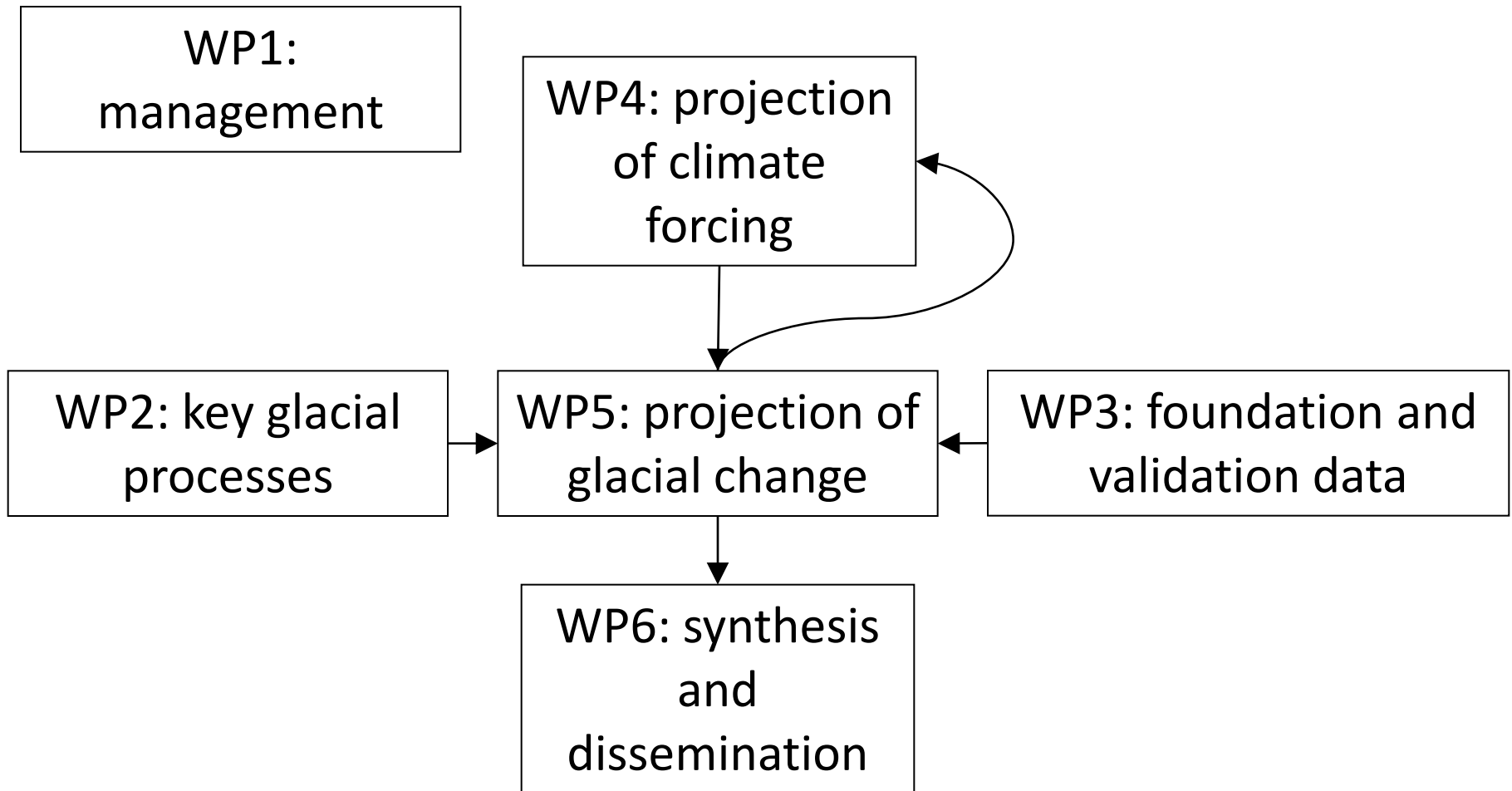
## Regional ocean modelling

- Antarctic ice sheet only – AWI FESOM model
- global finite element model with cavities and higher resolution around Antarctica
- to supply melt rates and temperature/salinity fields
- some plume modelling using T/S fields





# Work package structure



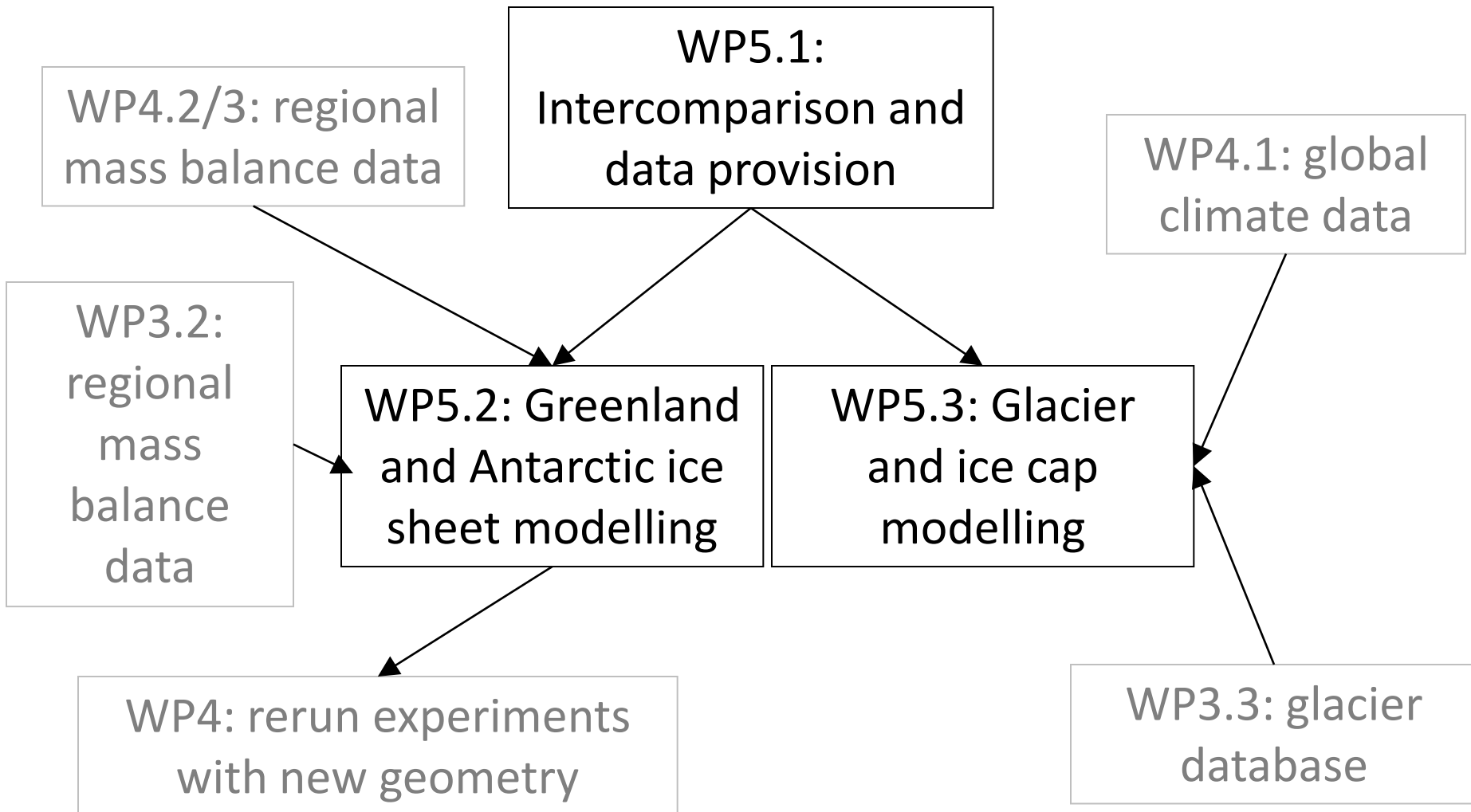
# Work package 2



## Process studies

- Pattyn will run a grounding-line intercomparison with the aim of making recommendations to WP5 (Sept 2010)
- other WPs focussing on meltwater lubrication (AWI drilling programme in Greenland Summer 2010) and calving models

# Work package 5

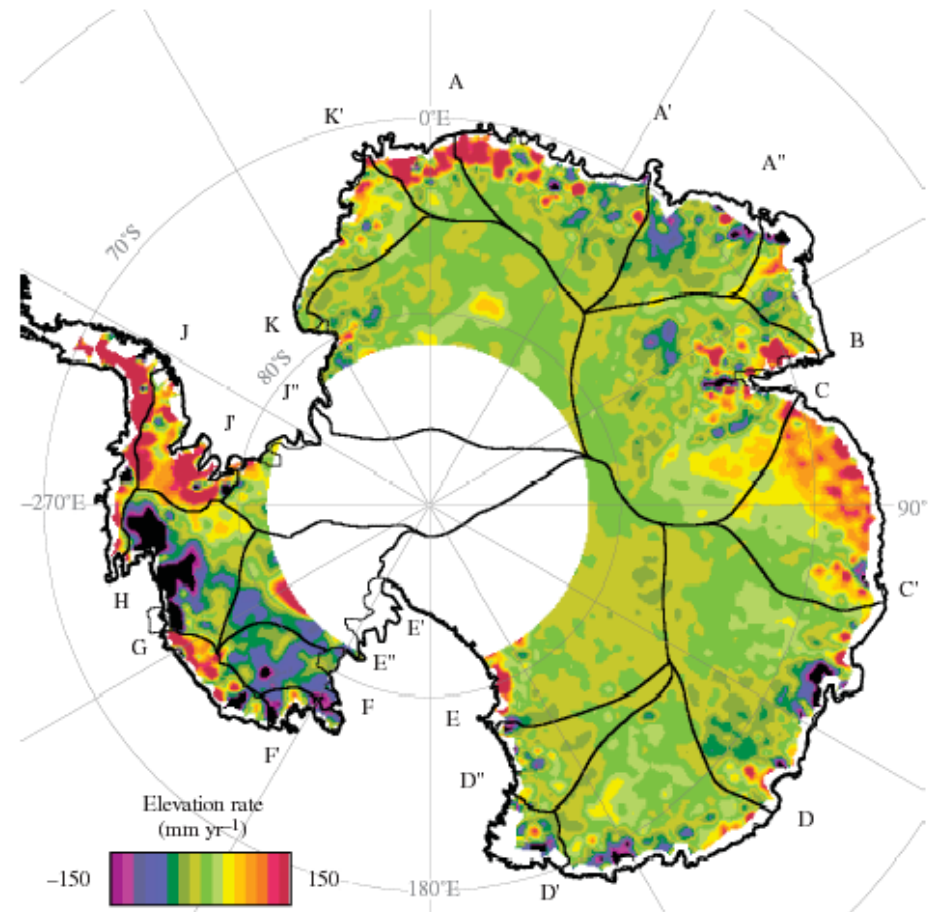


# Work package 5.1



## Intercomparison

- provide data from global and regional climate models
- provide boundary condition and geometry data for Greenland and Antarctica
- liaise with WP3 on validation data
- core groups funded for each ice sheet
- hoped that data sets will be available to wider community
- issues about publication, licensing etc need to be sorted



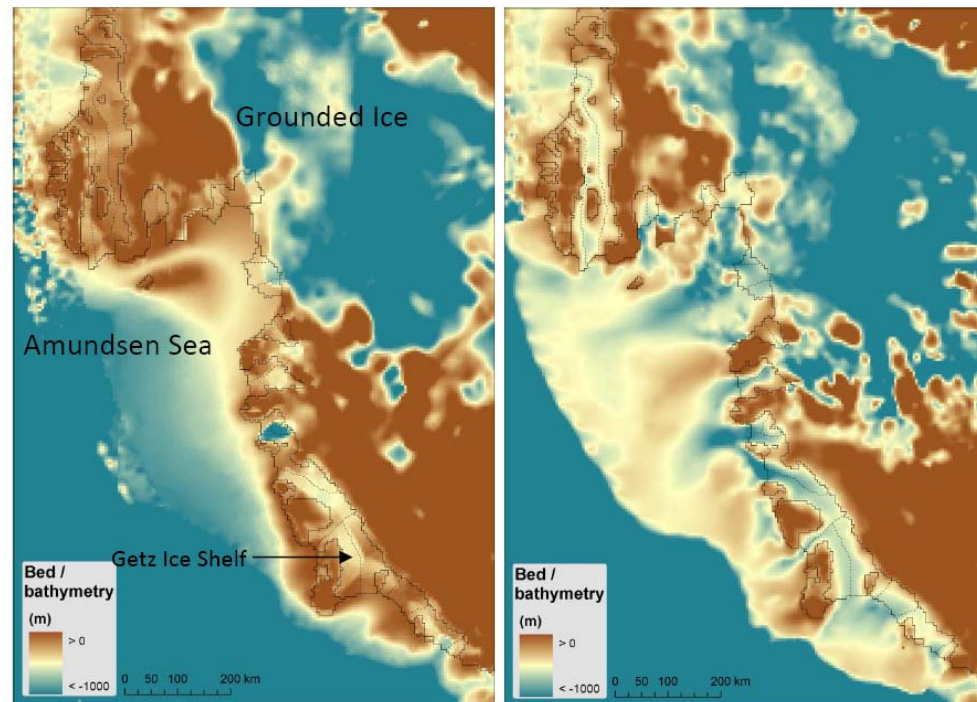
Thickness change from Davis and others 2005

# Work package 5.1



## Antarctic dataset

- 5 km gridded dataset
- all geometry and boundary conditions on common grid
- thickness, surface and bedrock consistent with one another and present-day grounding line
- will be freely available from *pangaea.de* repository



Images from Anne Le Brocq

# Work package 5.2



## Ice sheet modelling

- driven by regional A & O modelling
- direct surface mass balance predictions
- degree-day factors and climate variables needed if want to calculation locally (e.g., for oceans)
- verify against observed thinning rates for 1990 onwards
- assessment of the effects of parameter uncertainty
- effects not of coupling assess by rerunning regional climate models

# Work package 5.2



## Ice sheet modelling

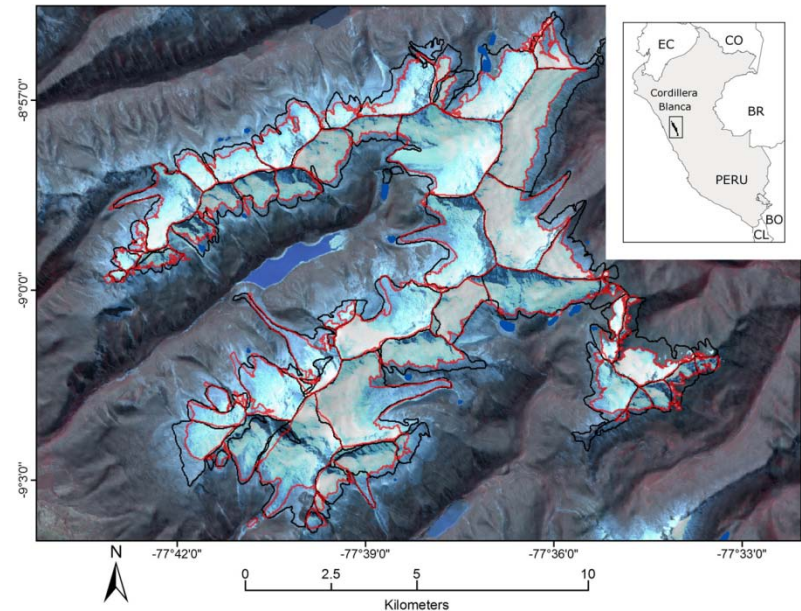
- Antarctic ice sheet – Huybrechts (Brussels), Payne (Bristol) & Ritz (Grenoble)
- Greenland ice sheet – Danish Met. Institute, Huybrechts (Brussels) & Ritz (Grenoble)
- global \* regional \* ice = 12-18 models for each scenario
- assessment of the effects of parameter uncertainty

# Work package 5.3



## Glacier and ice cap modelling

- driven by global climate data directly
- groups in Utrecht (Oerlemans) and Zurich (Paul) funded for glaciers
- close links to GLIMS & WGMS projects through WP3
- Chilean group will model Patagonian ice caps
- BAS will model Antarctic Peninsula



Example of GLIMS data from Peru



# Issues



- gaps for ice caps in particular Arctic Canada and Russia
- no work on Himalayan glaciers
- Greenland data sets
- initialization of higher-order ice sheet model is a real issue
- need fall back if grounding-line parameterizations fail or if validation poor