

Regional CO₂ balance

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Implemented modelling framework (Fig 1.) produces present CO₂ balance (Fig 2.) estimates of terrestrial ecosystems for Finland and its surroundings in spatial resolution of 0.1667°.

Regional climate model **REMO** developed in MPI-M, Hamburg is run in forecast mode to produce meteorological driving data:

- Model is initialised daily at 6pm
- Spun-up for 6 hours
- Run for 24 hours with hourly output
- Weather stays close to observed
- Sensitive to meteorological boundary data

Climate projection runs can be used as boundary data for REMO.

Land surface scheme **JSBACH** is forced off-line

- With hourly regional meteorological data (see Fig 4)
- With half hourly site level data (see Fig 3)

JSBACH calculates different ecosystem's response to meteorological conditions.

JSBACH can be run in a dynamic vegetation mode that responds to prevailing climate.

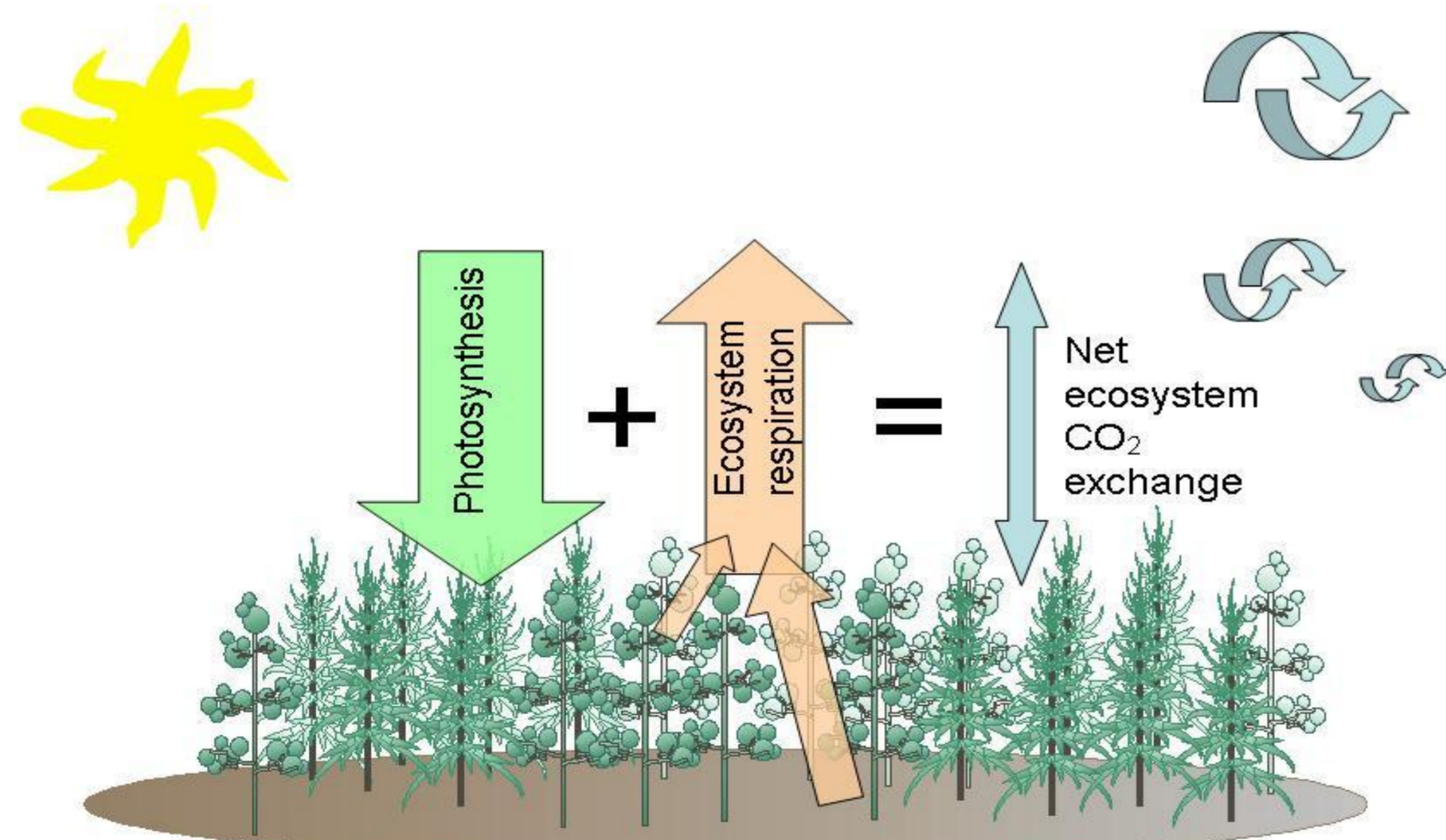


Figure 2: Terrestrial CO₂ balance consists of processes assimilating (photosynthesis) and emitting (respiration) CO₂. These are driven by environmental conditions such as air temperature, radiation and humidity.

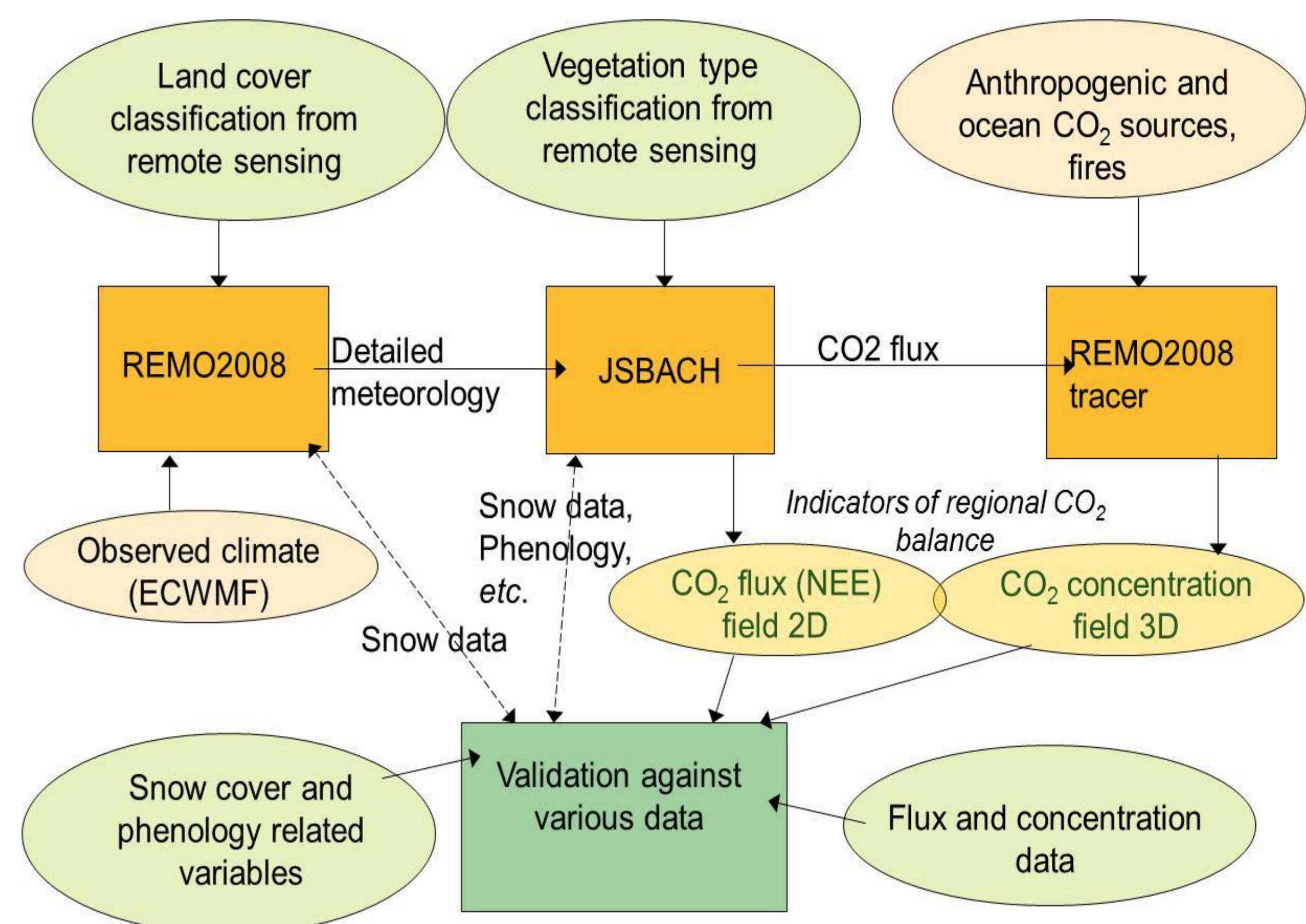


Figure 1: Modelling framework for one-way coupled REMO-JSBACH runs showing forcing, validation and production data flows

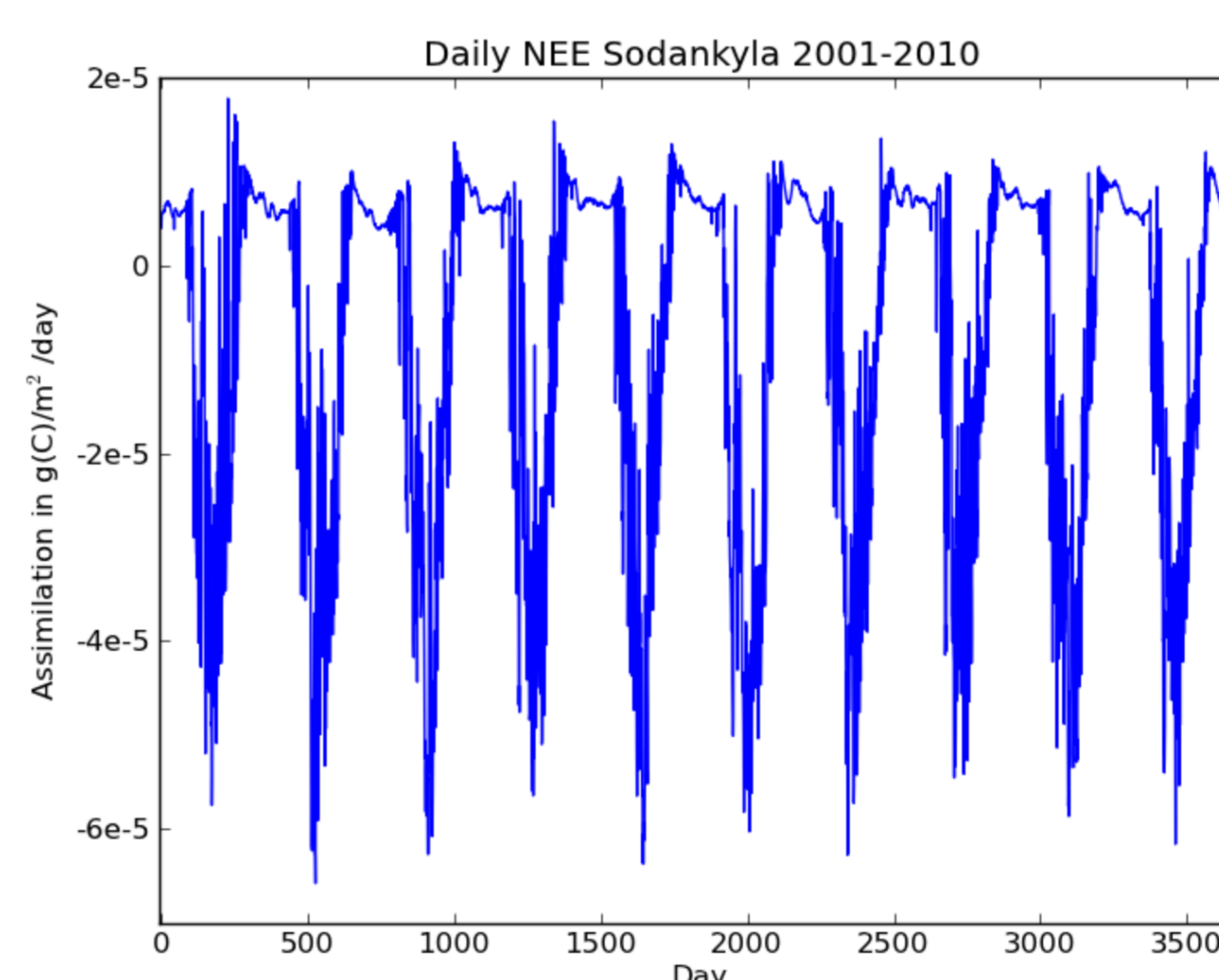


Figure 3a: Daily average net ecosystem exchange in Sodankylä in Northern Finland (67°21' N, 26°38' E, 179 m above the sea level) from 2001 to 2010. The sign in the figure is according to convention used for NEE: assimilation of CO₂ is negative and emission is positive.

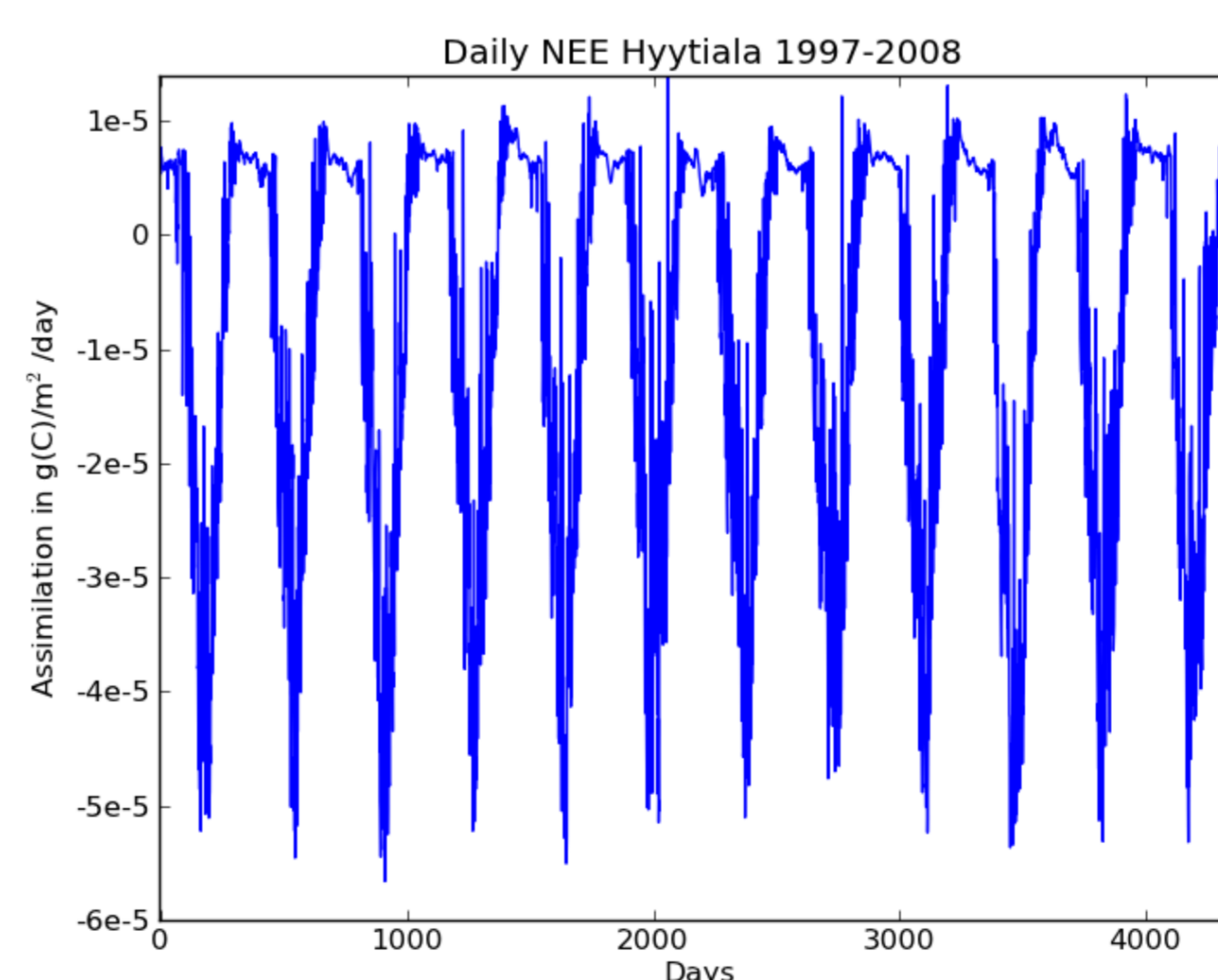


Figure 3b: Daily average NEE in Hyytiälä site in Southern Finland (61°31' N, 24°17' E, 181 m above the sea level) from 1997 to 2008. The sign in the figure as in the Figure 3a.

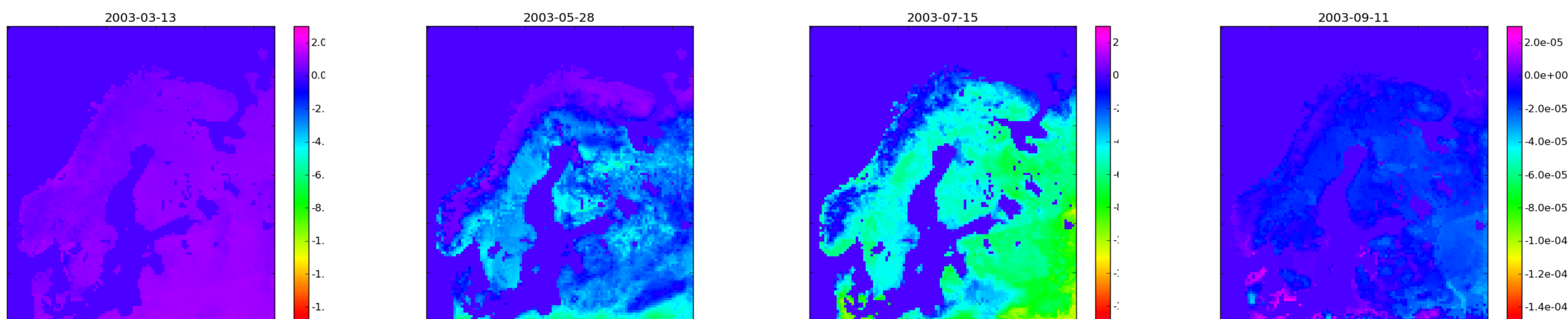


Figure 4: Daily mean terrestrial CO₂ balance of Finland and its surroundings (gm⁻²s⁻¹) during four days representing different seasons in 2003. Climatic forcing was produced with REMO forecast mode run.