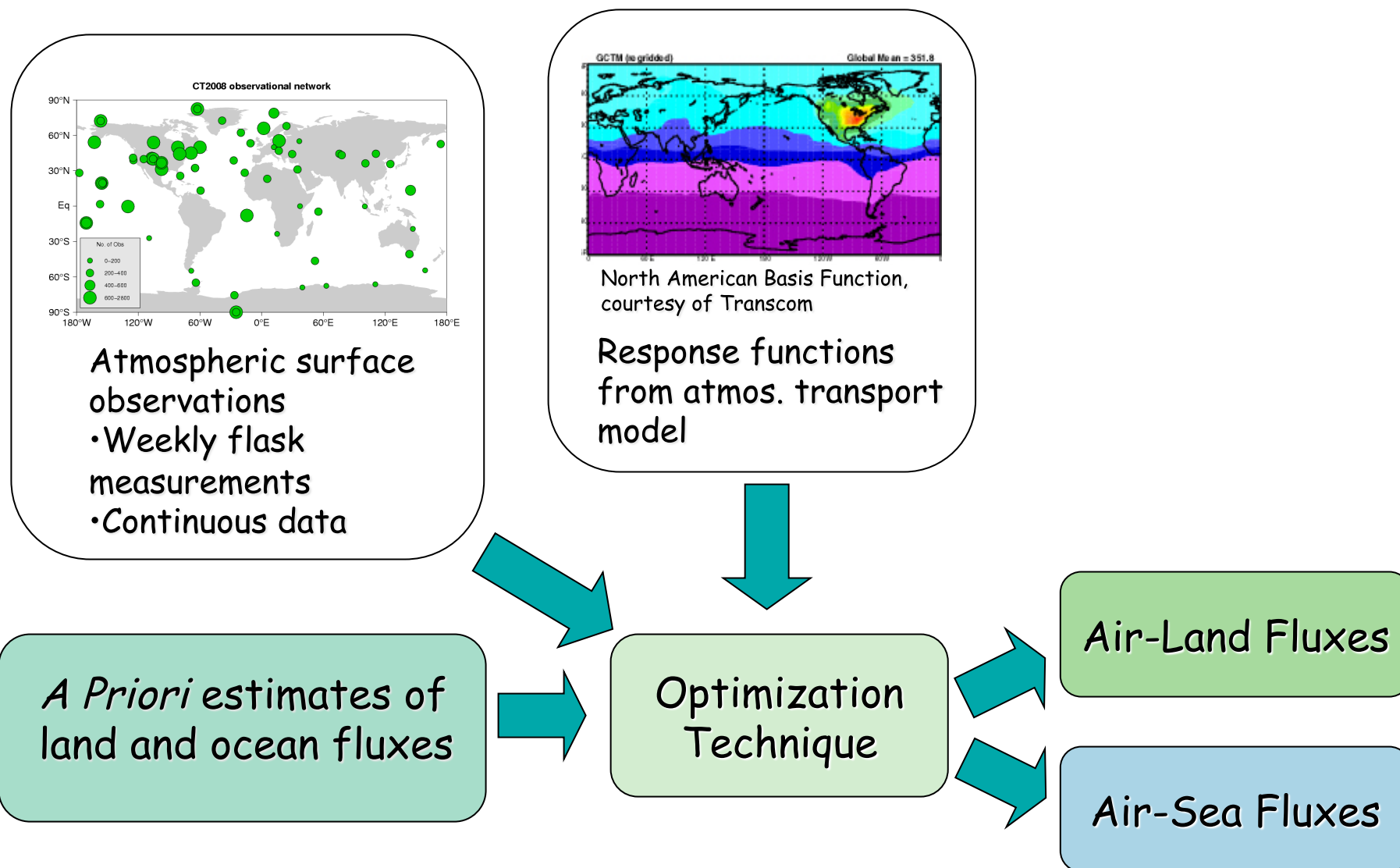


Combining atmospheric modeling and data to understand New Zealand's terrestrial and coastal carbon fluxes

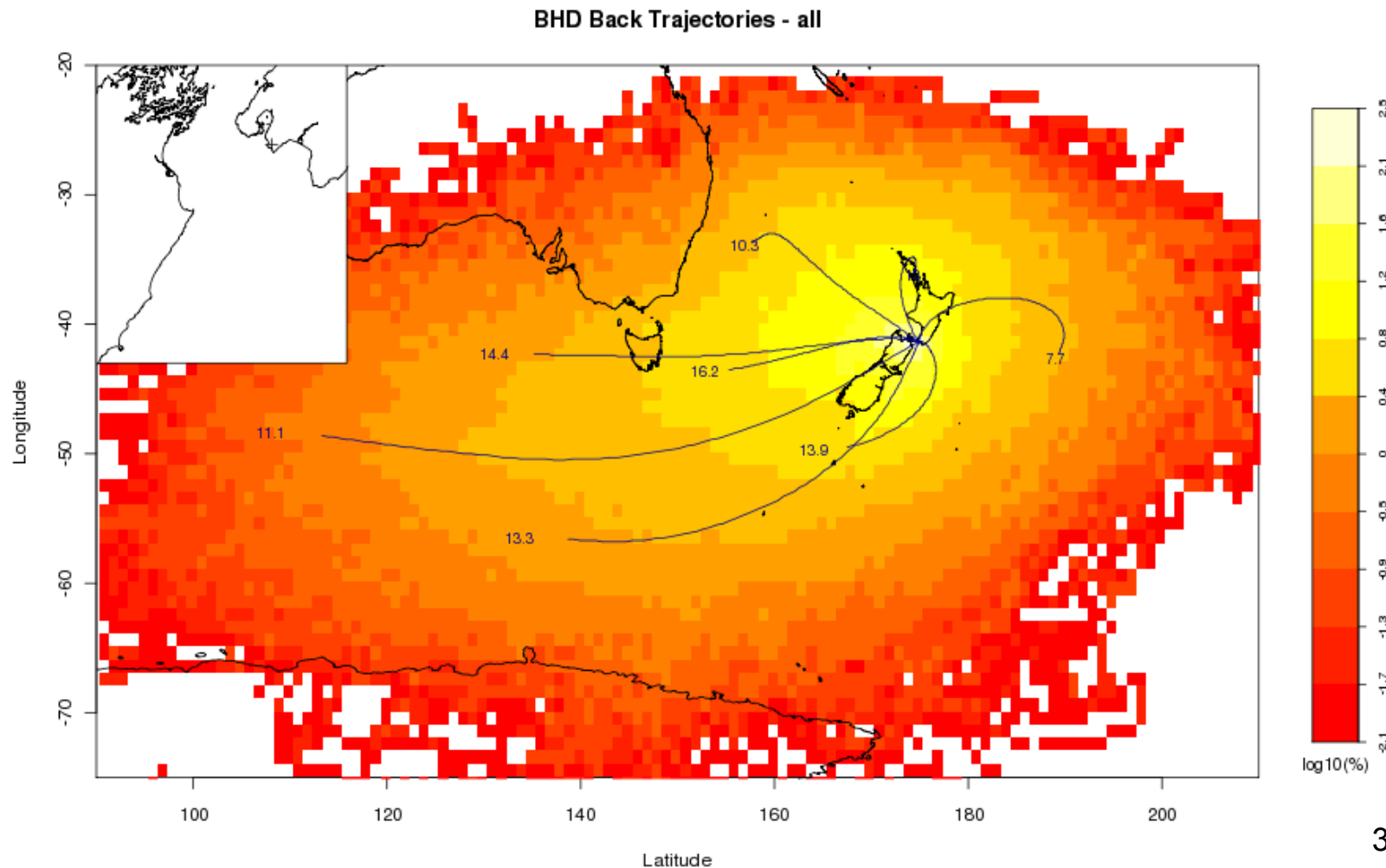
Kay Steinkamp, Sara Mikaloff Fletcher, Vanessa Sherlock, and Gordon Brailsford

- Inferring fluxes from atmospheric data
- What can in situ data tell us?
- Lagrangian modeling
- Atmospheric and oceanic data
- Project outline

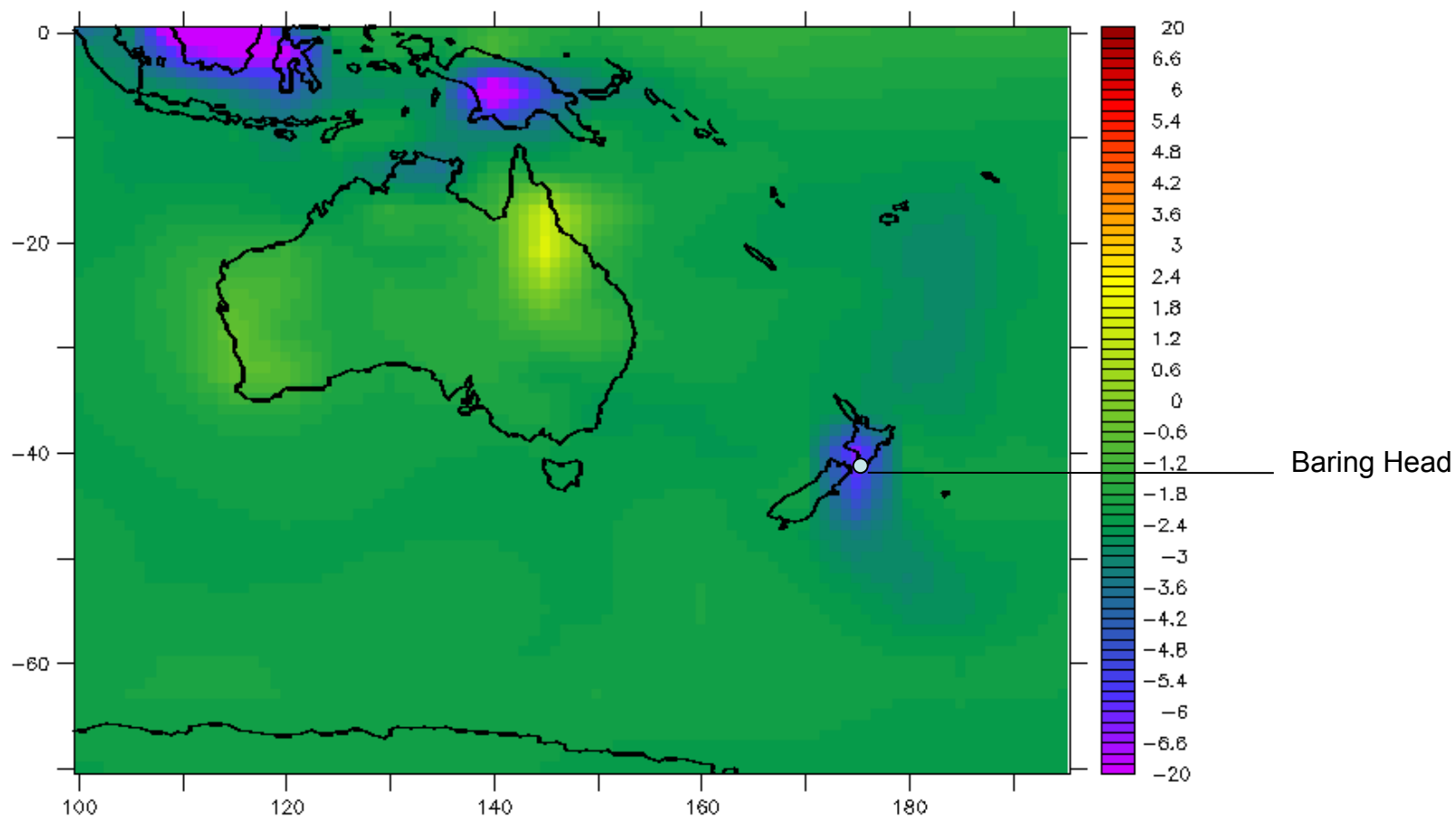
Atmospheric Inversions



What can *in situ* analysers see at Baring Head?



NIWA Atmospheric Data

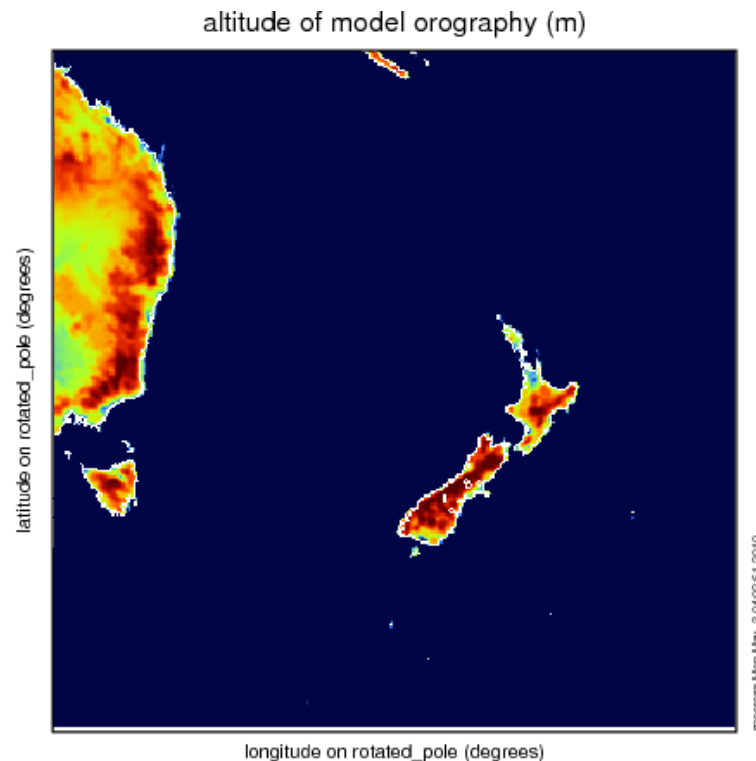


Modeled Terrestrial Biosphere Atmospheric CO₂ Footprint
at the Surface for 15 January 2008 (ppm)

Lagrangian Modeling

- Follows a group of particles as they move through the atmosphere; statistics over a large number of particles used to calculate dispersion
- Can be run backwards or forwards in time
- Use output from forecast or re-analysis products
- Computationally inexpensive to add additional sites
- We will be using the NAME model driven by meteorological output from two different forecast models

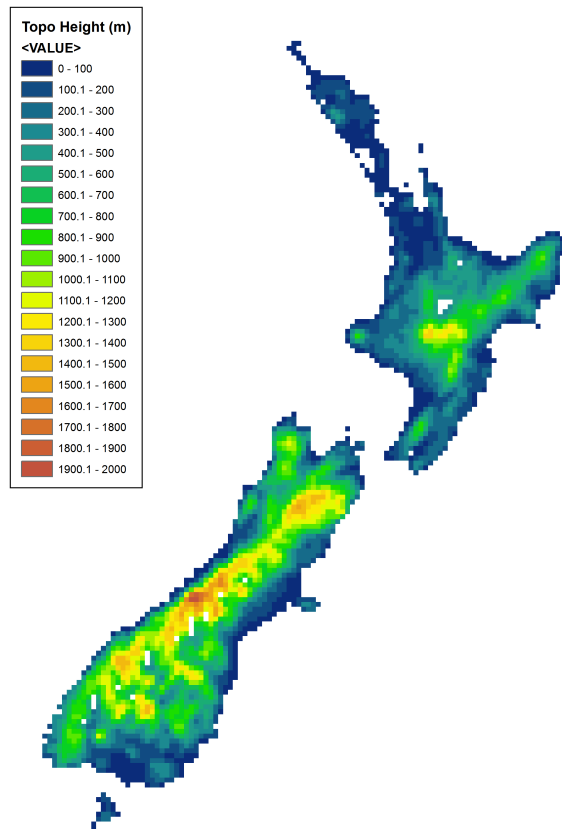
New Zealand Limited Area Model (NZLAM)



Range of altitude of model orography: 0 to 1163.23 m
Range of longitude on rotated_pole: 144.065 to 188.442 degrees
Range of latitude on rotated_pole: -56.1696 to -20.8598 degrees
Frame 178 in File qrparm.rog.nzlam12.nc

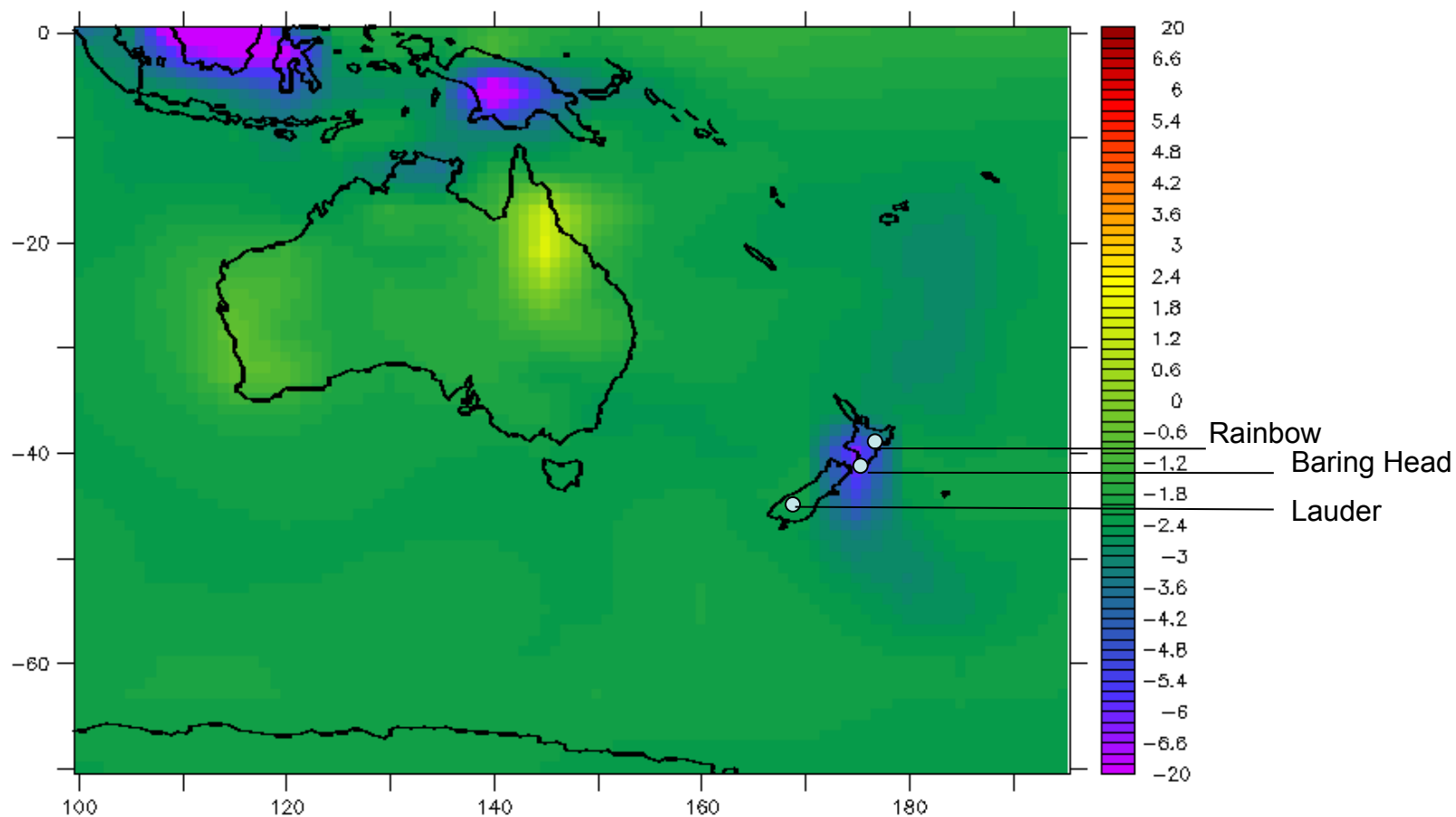
- State of the art data assimilating model
- 12Km and resolution
- Model output is available from 2005 to present

Weather Research and Forecasting Model (WRF)



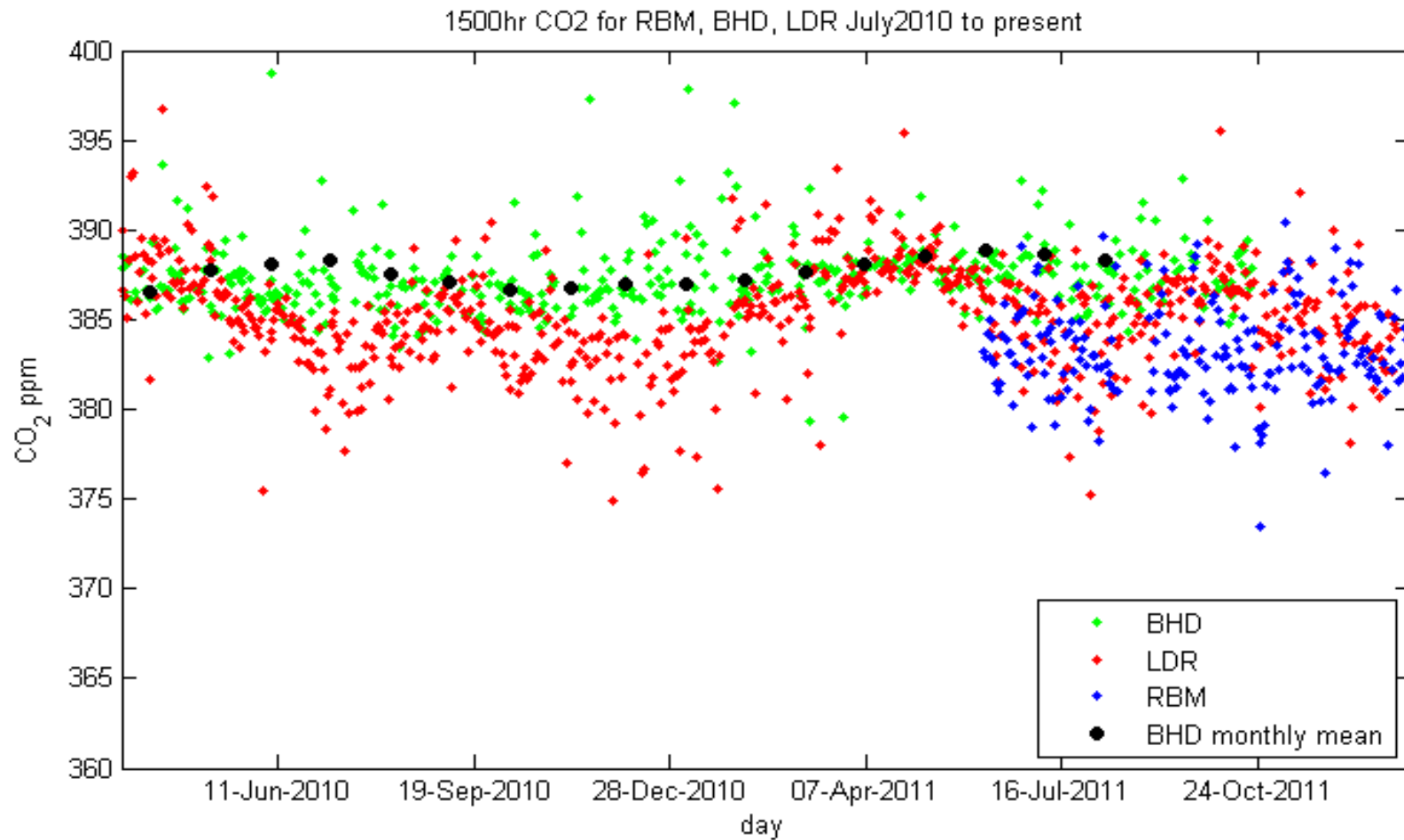
- 9Km/ 27 km/ 81 Km nested resolution
- 1970's to present
- Capability to extend boundaries to explore specific questions

NIWA Atmospheric Data



Modeled Terrestrial Biosphere Atmospheric CO₂ Footprint
at the Surface for 15 January 2008 (ppm)

Preliminary Data from RBM



Constraining Coastal Fluxes



- ROMS regional ocean model
 - Ocean biogeochemistry from PISCES and CESM
- Very likely this year: underway $\Delta p\text{CO}_2$ on the Tangaroa

Project Outline

- Characterize the transport at NIWA's stations
- Use cluster analysis to group the atmospheric CO₂ data into transport regimes and establish relationships between changes in atmospheric CO₂ and different transport regimes
- Infer CO₂ fluxes from the atmospheric measurements
- Investigate relationships between inferred fluxes and climate parameters