Clara Draper

NOAA Physical Sciences Laboratory
clara.draper@gmail.com
Citizenship: UK, Australia, USA.

Summary

My work to date has focused on research and development of land data assimilation, with a particular interest in coupled land/atmosphere data assimilation for applications in reanalyses and numerical weather prediction.

Education

2011: PhD. University of Melbourne, Faculty of Engineering, Melbourne, Australia
   Thesis: Near Surface Soil Moisture Assimilation of Numerical Weather Prediction
2006: MSc. Monash University, School of Mathematical Sciences, Melbourne, Australia
   Thesis: The Atmospheric Water Balance over the Murray-Darling Basin
2001: BSc/BEng. University of Melbourne, Melbourne, Australia (Maths./Env. Eng.)

Professional Experience

2017 – current: NOAA Oceanic and Atmospheric Research, Physical Sciences Laboratory
04/2021 – present: Physical Scientist
04/2017 – 04/2021: Research Scientist III (with University of Colorado, CIRES)

Lead land data assimilation developer for NOAA's global modeling systems, including development of a prototype coupled land/atmosphere data assimilation system for numerical weather prediction (NWP), and providing in-depth guidance to National Weather Service (NWS) colleagues on operational implementation and future land data assimilation strategies.

- Developed a major upgrade to NOAA's global NWP snow data assimilation system, including overseeing the initial development and testing of the new snow data assimilation, then completing transition of this system into the Joint Effort for Data assimilation Integration (JEDI) software, additional testing, evaluation, and refinement, providing assistance in transition to operations. The new snow data assimilation improves model snowpack and low-level temperatures over land, and is currently being tested within the NWS's workflow.
- Built an offline (land-only) modeling and data assimilation driver to replicate the land model and land data assimilation being developed for NOAA's global NWP. This driver has been released to the public as a tool to facilitate external research contributions, and is invaluable for spin-up, testing, and evaluation of the land model and data assimilation.
- Developed a scheme to perturb NOAA's NWP ensemble members to account for uncertainty in the land model. This scheme improves the realism of the ensemble covariances at/near the land surface, which is necessary for ensemble-based coupled land/atmosphere data assimilation.
- Developed an early prototype soil moisture and soil temperature analysis for NOAA's global NWP system, including investigation of coupling strategies for the assimilation of (interface)

screen-level observations into the land and/or atmosphere. The new soil analysis is still being rapidly developed, with results to date demonstrating a strong potential to improve the low-level atmospheric analyses, likely leading to an operational implementation.

2011 – 2017: NASA Global Modeling and Assimilation Office
05/2011 – 02/2017: Research Associate, Scientist II, Scientist III (with University Space Research Association)
02/2011 – 05/2011: Research Associate (with University of Maryland Baltimore County)

Evaluation of land-related variables and processes in the MERRA-2 reanalysis, and development of NASA's land data assimilation system, including coupling the land and atmospheric data assimilation systems.
- Led evaluation of the land surface temperature and energy output in the MERRA-2 reanalysis and contributed to the evaluation of the moisture outputs.
- Coupled the pre-existing land and atmospheric data assimilation systems, and demonstrated the potential to improve the low-level atmospheric temperatures in NASA's reanalysis by assimilating remotely sensed soil moisture. This approach was recommended for NASA's subsequent reanalysis, and has since been developed further.
- Research and development related to land data assimilation, including assimilation of satellite soil moisture and land surface temperature, evaluation methodology for land variables and land data assimilation, evaluation and definition of biases related to soil moisture assimilation, and Kalman filter estimation of biases within data assimilation.

2010: Centre National de Recherches Météorologiques (CNRM) / Météo-France
04/2010 – 12/2010: Associated Scientist

Developed an application to improve flood forecasts by assimilating satellite soil moisture.

2004 – 2008: Australian Bureau of Meteorology Centre for Weather and Climate Research
06/2004 – 06/2008: Professional Officer

Analysis of water balance over Australia; demonstration of improved NWP forecasts from assimilation of satellite soil moisture.

Community Leadership
- International Earth Surface Working Group chair (2023 – current)
- WMO Working Group on Data Assimilation and Observing Systems committee member (2023 – current)
- NASA SMAP Science Team member (2020 – current)
- American Meteorological Society (AMS) Hydrology Committee member (2018 – present). AMS Annual Meeting Conference on Hydrology Chair (co-chair 2020, 2021; chair: 2022).
- AMS Annual Meeting Conference on Hydrology, Land Data Assimilation Session Chair (2016, 2017, 2018, 2020, 2021, 2024)