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Meteorological forcing, ancillary data and evaluation methods as sources of errors and uncertainty in JULES

Cecile Menard
Finnish Meteorological Institute

With thanks to: Jaakko Ikonen, Kimmo Rautiainen, Riika Ylitalo, Jouni Pulliainen (FMI); Richard Essery (UoEdinburgh); Graham Weedon, Matt Pryor (Met Office)

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Modeller's choices

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~~Meteorological forcing, ancillary data and evaluation methods~~ Users as sources of errors and uncertainty in JULES

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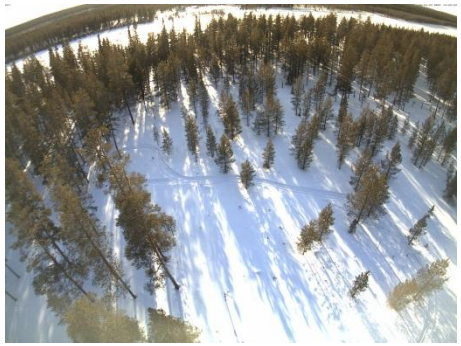
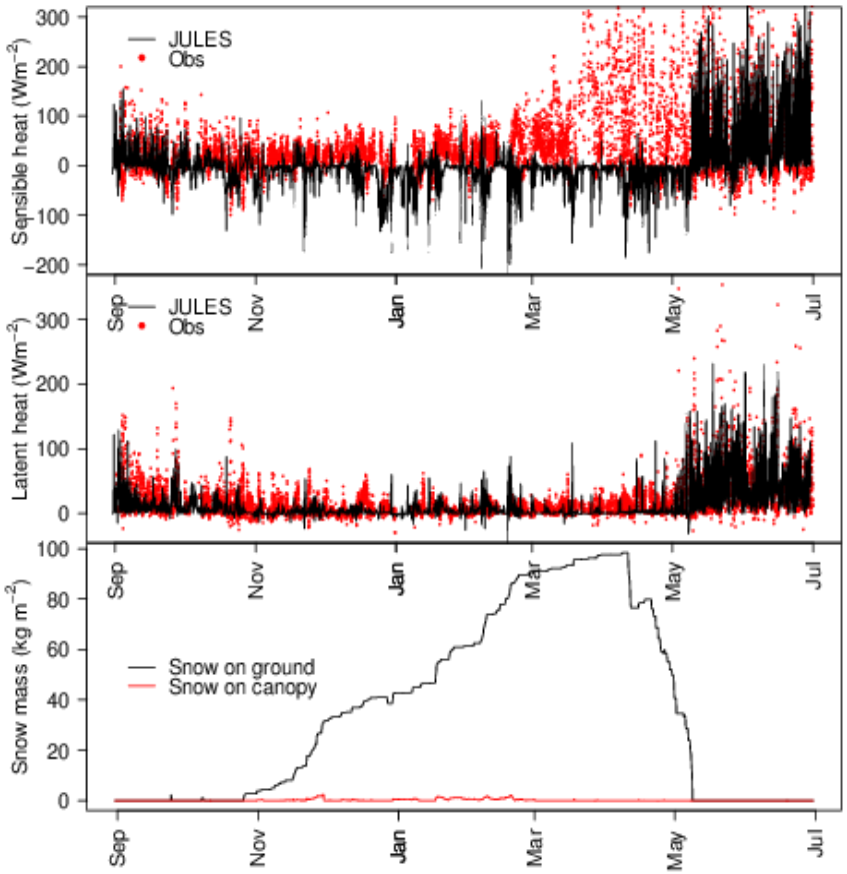
JULES meeting Edinburgh 2013





I think there is a problem with the snow module

Hmmm….

Bla bla
canopy_model = 4
bla bla

A few weeks later….

=> Problem traced to new switch in JULES *nml

How much of JULES's performance is due to poor process representation and how much to poor implementation of JULES?

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- **Choice 1: Site**

  Two sites in Finnish Lapland: Clearing + Forest, 2007-2012

- **Choice 2: Meteorological data**

  FMI AWS, WFDEI, NCEP CFSR/CFSv2

- **Choice 3: Ancillary data (LAI, snow-free albedo, canopy height, vegetation fraction)**

  In situ measurements, Met Office CAP

- **Choice 4: Performance metrics**

  uRMSE, RMSE, bias, R, σM / σO,

  variance (quantification of uncertainty

- **Choice 5: Temporal scale of output**

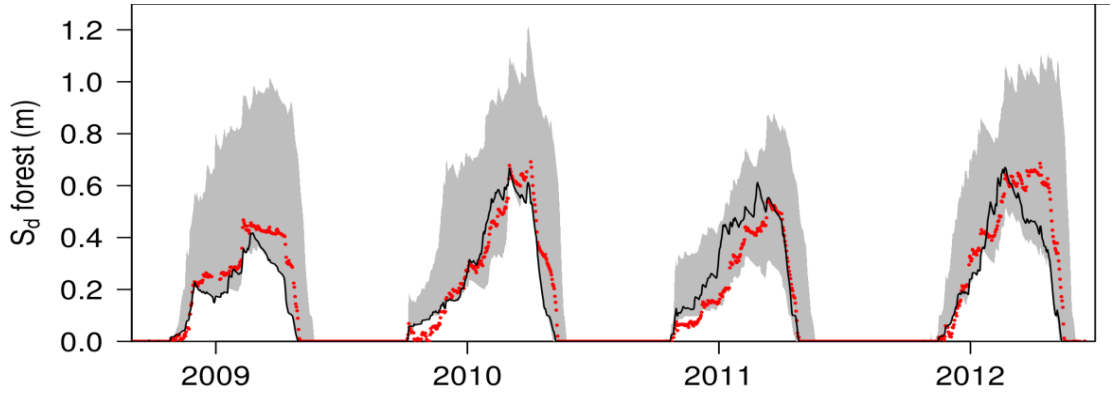
  Hourly, daily, monthly, seasonally

- **Choice 6: JULES 3.0 to 4.1**

Menard et al., JHM, submitted

Conclusions

1. **JULES does not produce significant bias and the modelled amplitude and seasonality correspond well to measurements at the studied site when provided with *measured* meteorological and ancillary data.**
2. **At times, performance metrics (RMSE, R, σ_M/σ_O, bias) of the NCEP and WFDEI members suggested that they performed well but they didn't: "right results for the wrong reasons".**



Menard et al. *JHM* Submitted

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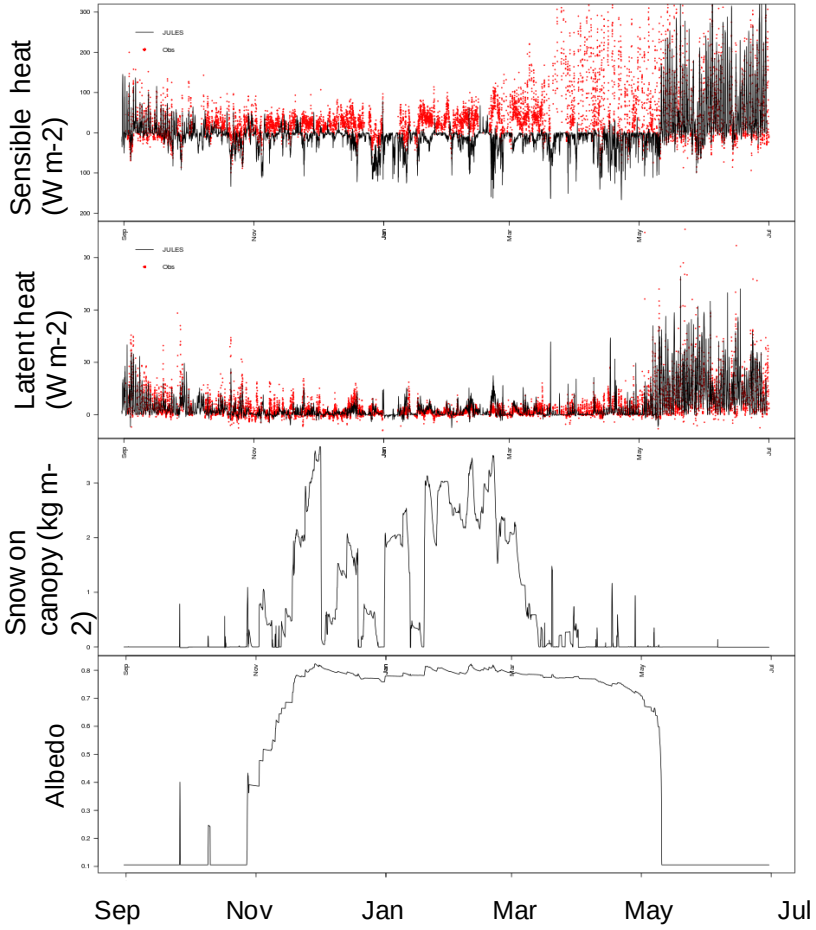
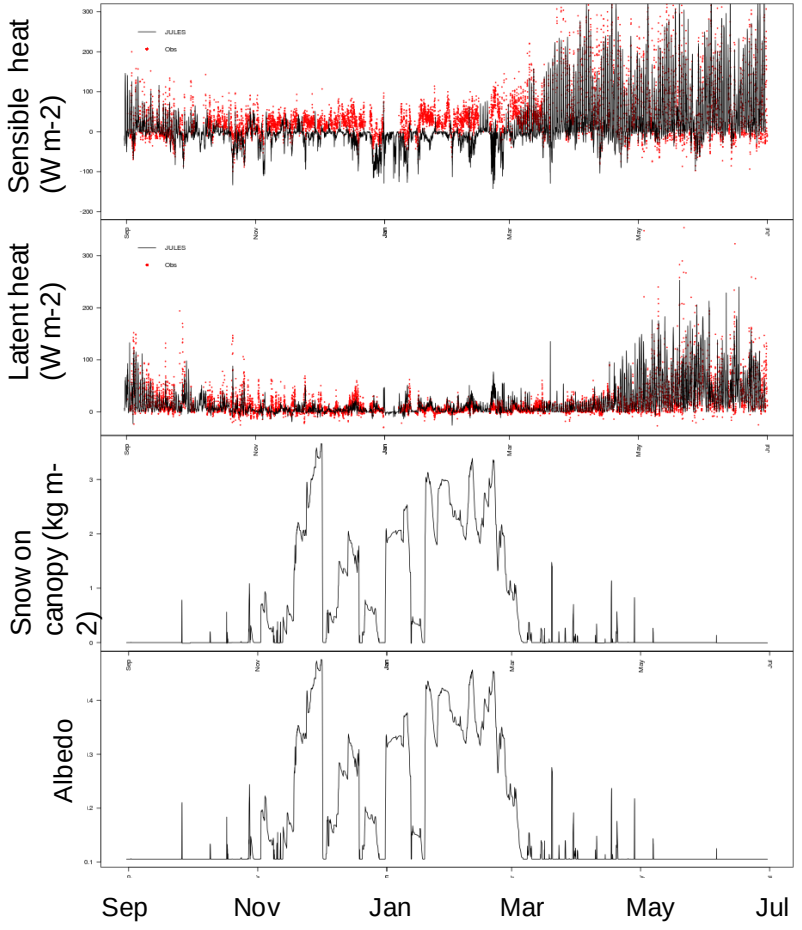
2. **At times, performance metrics (RMSE, R, σ_M/σ_O, bias) of the NCEP and WFDEI members suggested that they performed well but they didn't: "right results for the wrong reasons".**
3. **The ability of the model to reproduce the snow depth and water equivalent had a considerable effect on all of the other evaluated model outputs.**
4. **Model results significantly differed depending on the version of JULES used.**

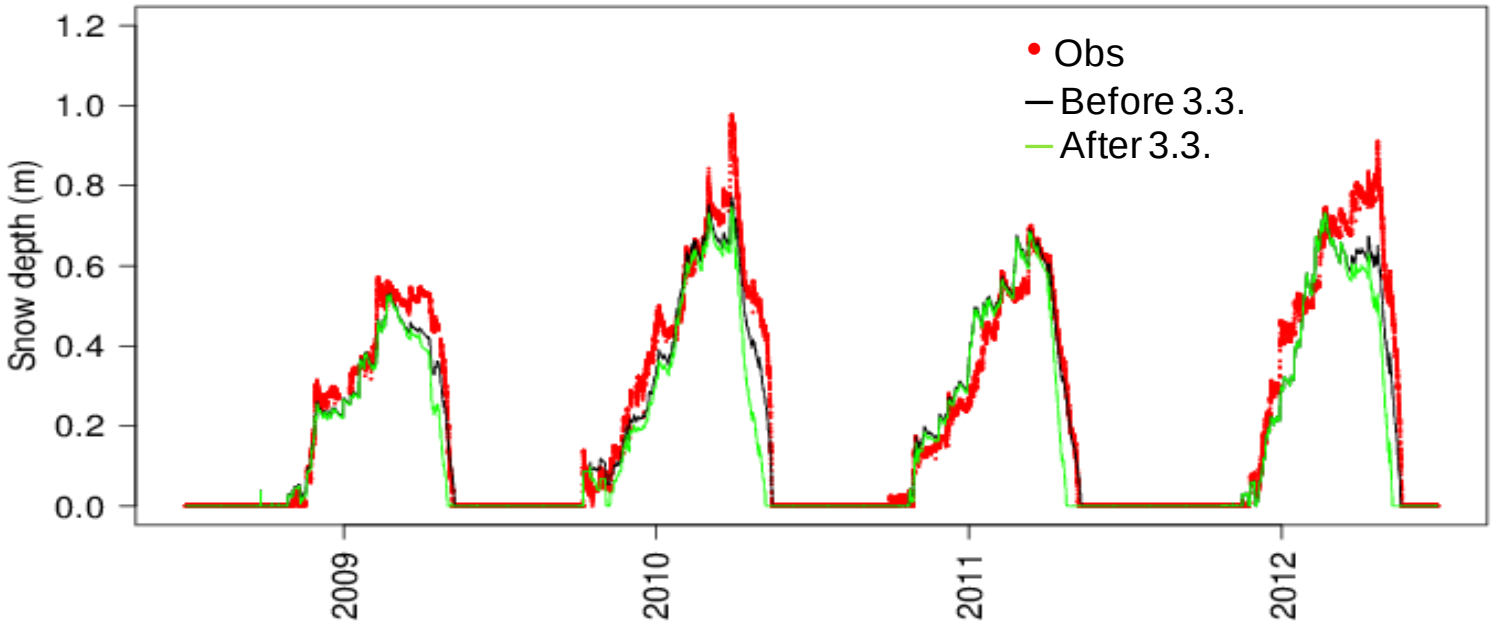
Menard et al. *JHM*
Submitted

Since JULES 3.0 l_snowdepth_surf + can_model = 4





Since JULES 3.3.
l_snowdepth_albedo + l_spec_albedo



Final remarks…

- JULES performs well at this site *but…*
- …sometimes for the wrong reasons…
- …only if we know how to juggle with its logical switching.
- What are the implication for
  - The JULES community?
  - The published model results (e.g. global scale)?
  - Funding?
- Should we focus on training or a “science” manual?