



# Can Antarctic sea ice loss affect the summer monsoon rainfall?

- Insights from a new project called **C-ICE**

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## ■ Management

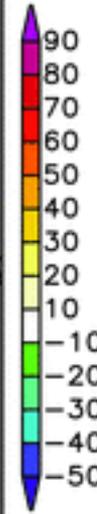
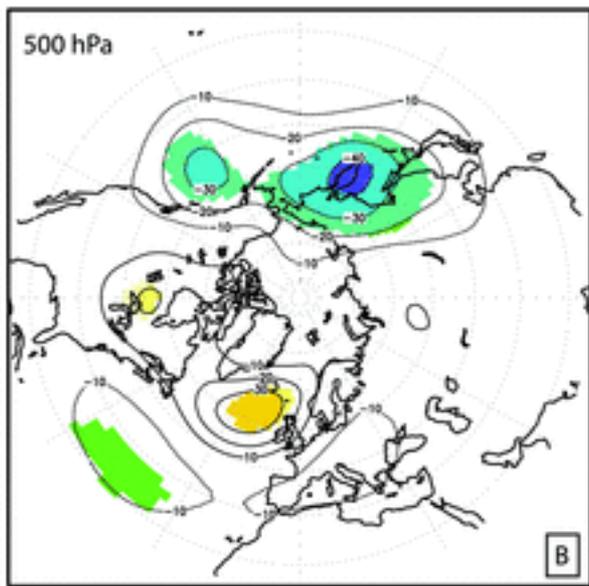
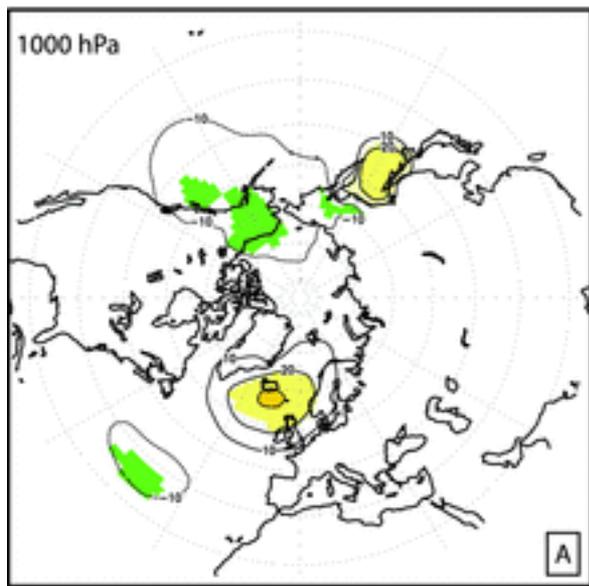
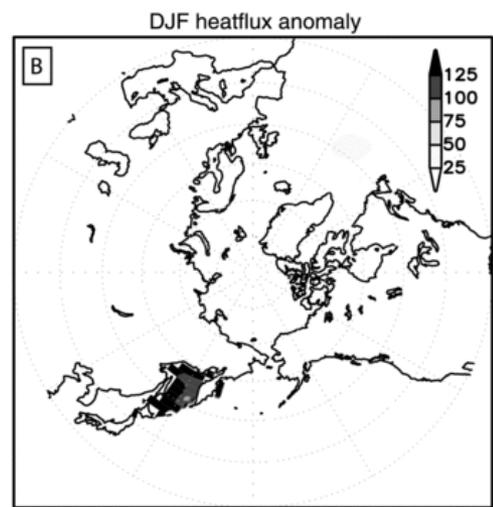
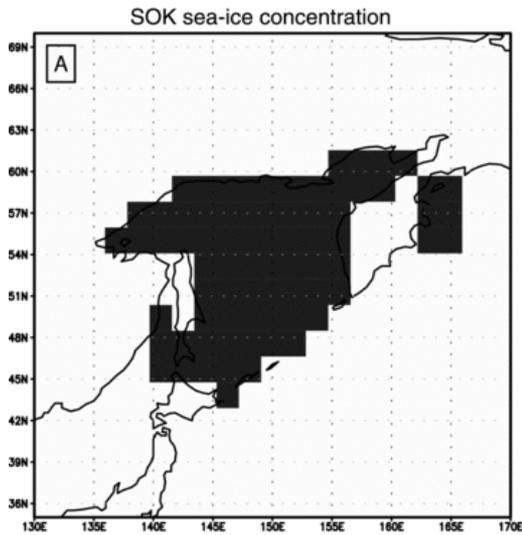
- Uni Research Climate, Bjerknnes Centre, Norway
- The Energy and Resources Institute, TERI, India

## ■ Partners

- British Antarctic Survey, England
- Max Planck Institute for Meteorology, Germany
- University of Bergen, Norway
- University of Reading, England

- URL: [goo.gl/nGLyz4](http://goo.gl/nGLyz4)

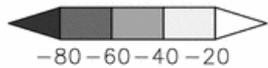
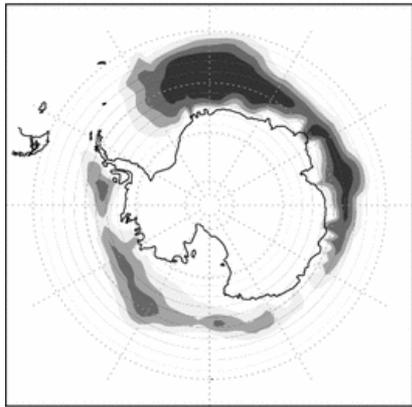
# + Is it possible?



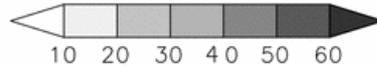
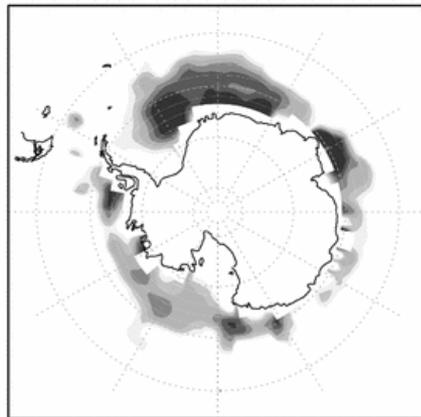
# + Antarctic sea-ice loss: implications

ECHAM5/MPI-OM IPCC SRESA1B scenario for 2081–2099 and present-day climatology (1981–1999)

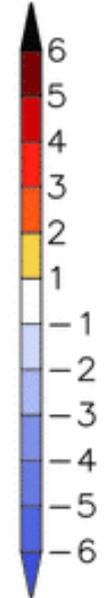
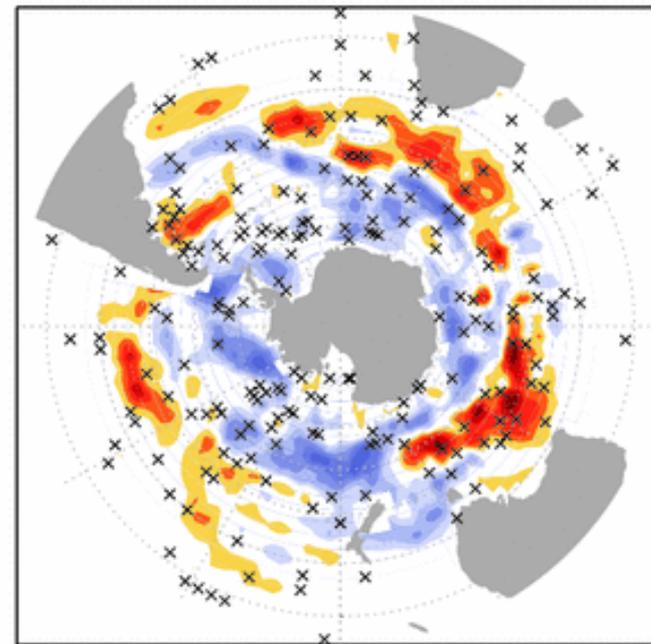
(a) sea ice concentration anomaly JAS [in %]



(b) heat-flux anomaly JAS [ $\text{W}/\text{m}^2$ ]

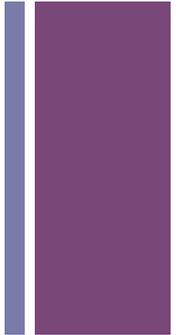


Track density

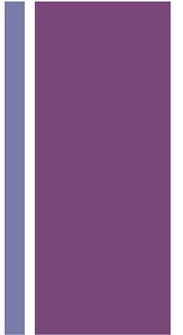


# + What we propose to test

- Whether a future Antarctic sea-ice loss may lead to a substantial and robust impact on the spatio-temporal distribution of ISM rainfall
- We expect that the Antarctic future sea-ice loss is more important for the ISM than that projected for the Arctic because the heating anomalies associated with the sea-ice reduction are by far the largest in the corresponding winter season



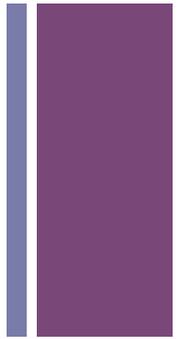
# + Two-fold hypothesis



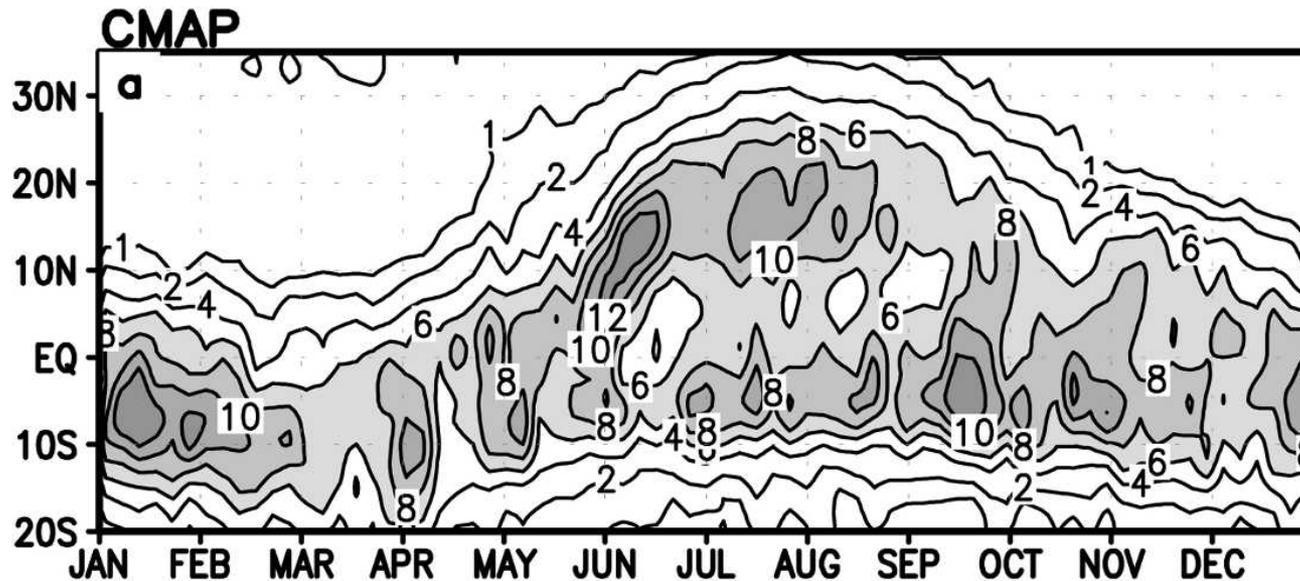
- **first** part: Antarctic sea-ice loss reduces the southern-hemisphere winter atmospheric heat deficit in such a way that less energy has to be transported by the Hadley circulation from the warmer summer Northern Hemisphere (NH). The adjustment of the solstitial Hadley cell leads to an southward shift of the mean ITCZ.
- **second** part: southward shift of the ITCZ may favour break-type circulation regimes for the ISM.



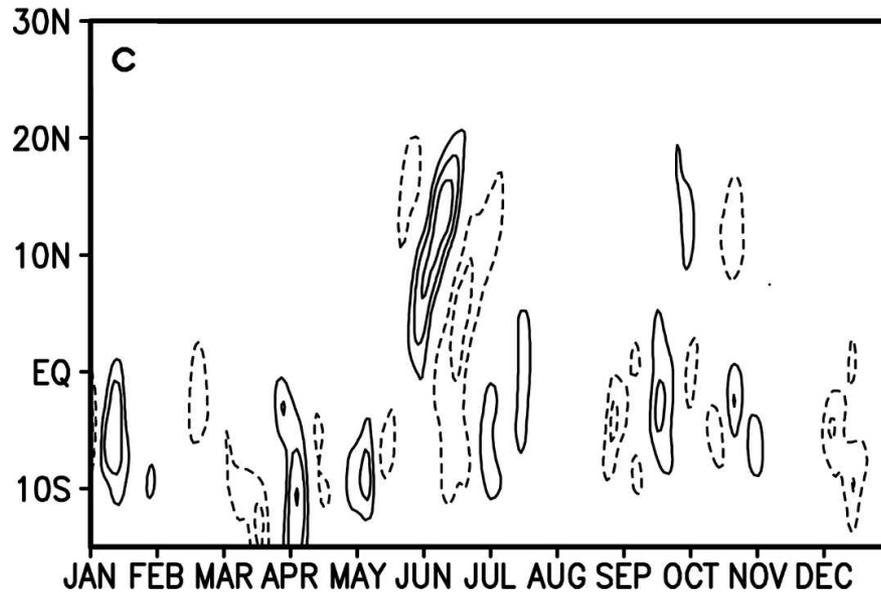
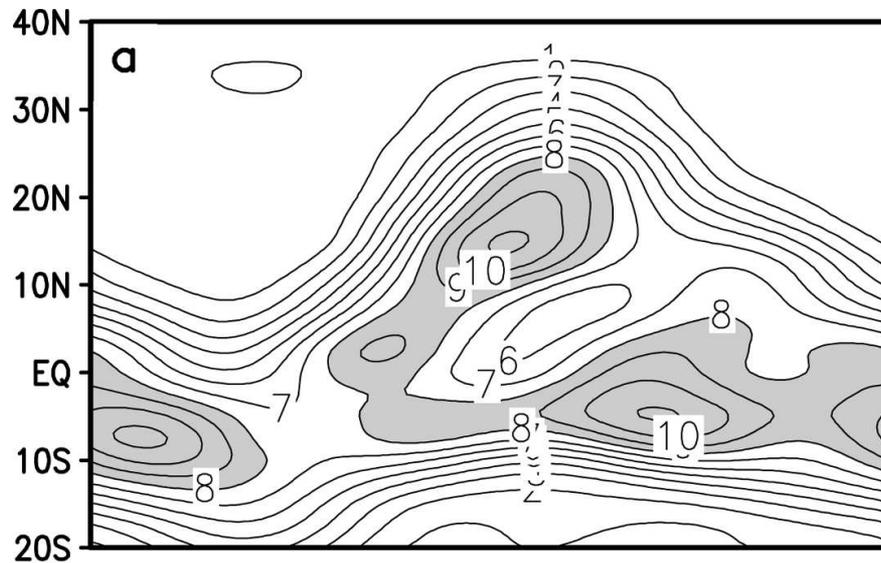
# Link between ITCZ and ISM



Annual evolution of the ITCZ over, (a) the Indian monsoon region, defined by climatological precipitation (mm day<sup>-1</sup>) averaged between 70° and 90°E

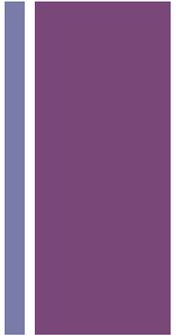


# + Slow/fast annual cycle



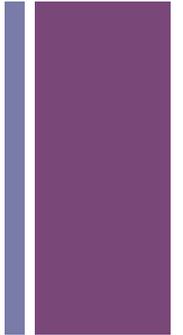
■ Goswami et al. (2006, J. Climate)

# + Work Packages



- WP1: Analysis of existing model simulations, definition of relevant indices, preliminary hypotheses and core sensitivity experiments
- WP2: Interdependence of the zonal-mean atmospheric circulation, the ITCZ and the ISM
- WP3: Interaction between the southern annular mode and sea-ice via storm track dynamics
- WP4: Outreach, hydrological implications, and research school

# + Thank you!



- If you are interested in the project, or if you would like to be a stakeholder in our discussions, feel free to send us an e-mail:
  - [michel.mesquita@uni.no](mailto:michel.mesquita@uni.no)