

ATS/CIRA Colloquium

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Visiting ATS from the University of Colorado Boulder

**Assessing the Predictability and Probability
of a Summer Ice-Free Arctic**

Hosted by Eric Maloney

Friday, Nov. 2, 2018

ATS room 101

Discussion will begin at 11:15 a.m.

Refreshments will be served at 10:45 a.m. in the weather lab

How predictable are future changes in Arctic sea ice, and in particular the occurrence of ice-free conditions in the summer? I will answer this question using ensemble simulations from the Community Earth System Model (CESM) forced by a range of emission pathways, resulting in global temperature changes of 1.5°C to 4.5°C above pre-industrial by the year 2100. I will show that after 2045, scenario uncertainty dominates over internal-variability uncertainty for projections of Arctic September sea ice extent. This means that for the next several decades, the sea ice evolution will be determined primarily by internal variability, superimposed upon a trend of steadily declining sea ice. At the same time, this also means that the world's emission choices over the next few decades will have a clearly detectable effect upon the mid-to-late 21st century Arctic sea ice cover. In particular, I will show that only by limiting warming to 1.5°C above pre-industrial, any occurrence of an ice-free Arctic in September can potentially be avoided before 2100. Warming of 4.5°C, on the other hand, will lead to ice-free summers that are four months long each year in the late 21st century. The timing of the first occurrence of ice-free conditions, however, cannot be predicted with a range of less than 20 years due to internal variability alone, and this range grows even larger when scenario uncertainty is considered.

Link to colloquia page: <https://www.atmos.colostate.edu/colloquia/>