

# Arctic rapid sea ice loss events in CMIP6 simulations

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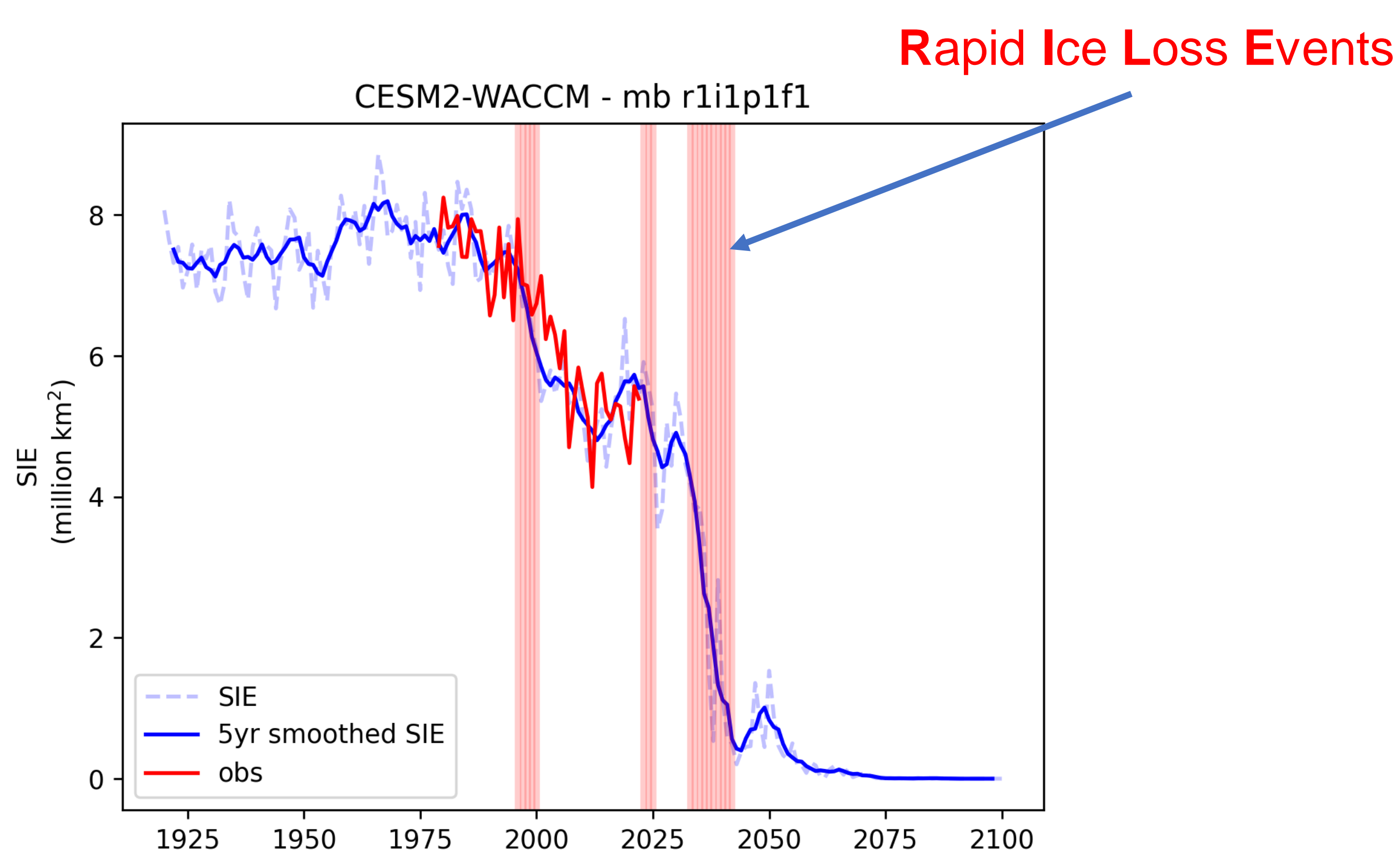
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## Background

The decrease in summer Arctic sea ice extent is marked by periods of **rapid ice loss**, known as rapid ice loss events (**RILEs**), which are expected to become **more frequent** in the coming decades. However, the causes of RILEs are not well understood and it is **difficult to predict their occurrence** a season to several years ahead. It is essential to improve our understanding of these events and their potential impacts on ecosystems and societies, as the rate of sea ice decline can affect the ability to adapt to rapid change.

## Definition of a RILE

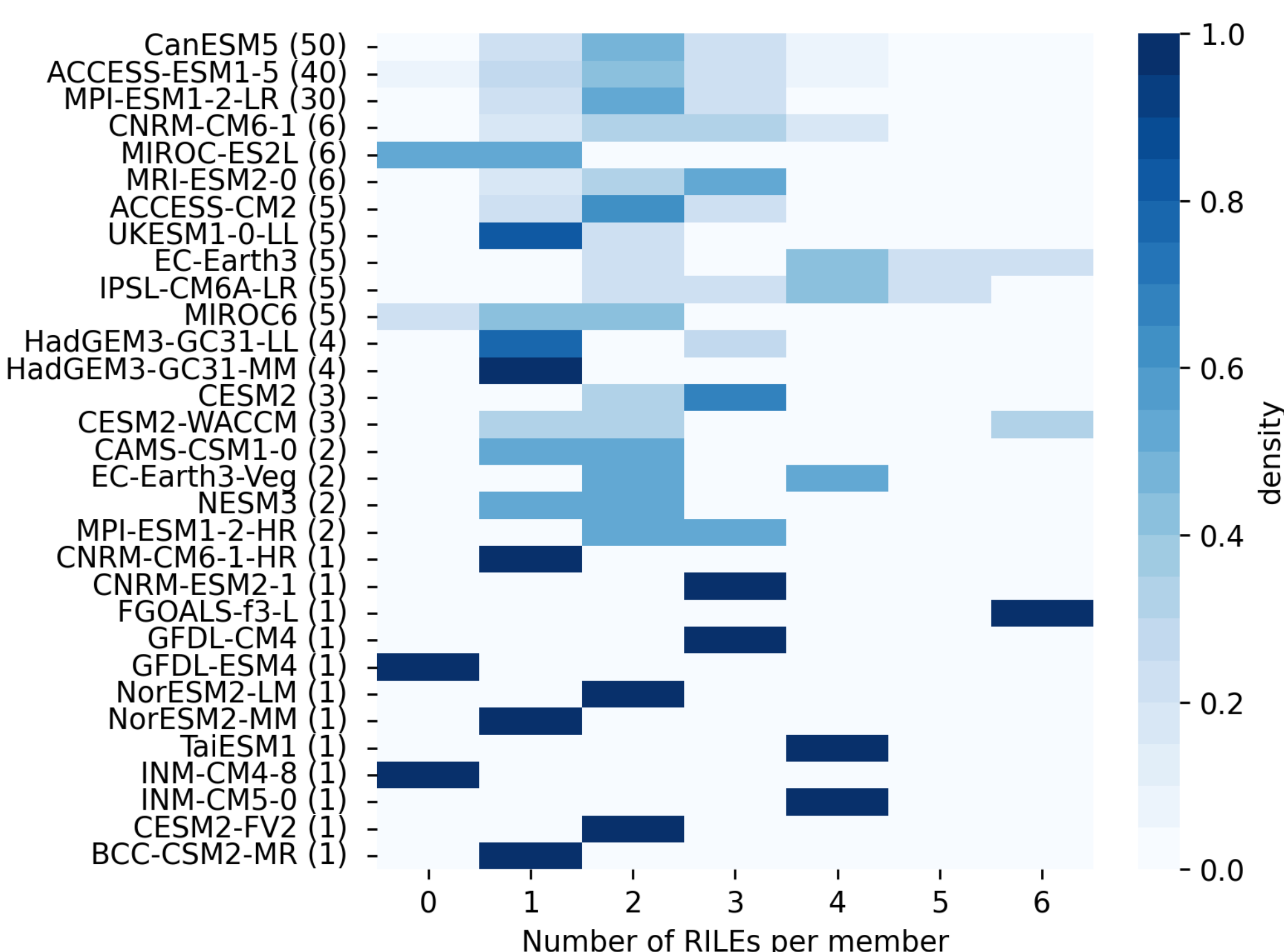
Sequence of at least **4 consecutive years** for which the trend in the 5-yr smoothed SIE is **less than -0.3 million km<sup>2</sup>/year** (Auclair & Tremblay 2018, AT18).



September sea ice extent trajectory and 5-year running mean of SIE according to one member of CESM2-WACCM model. RILEs are highlighted in red according to AT18. Average September Arctic sea ice extent for 1979 to 2023 from NSIDC.

## How RILEs are pictured in CMIP6?

RILEs occur in almost all members in global climate model for SSP585 and SSP126 scenarios. Models have mainly **one to three** RILEs per member.

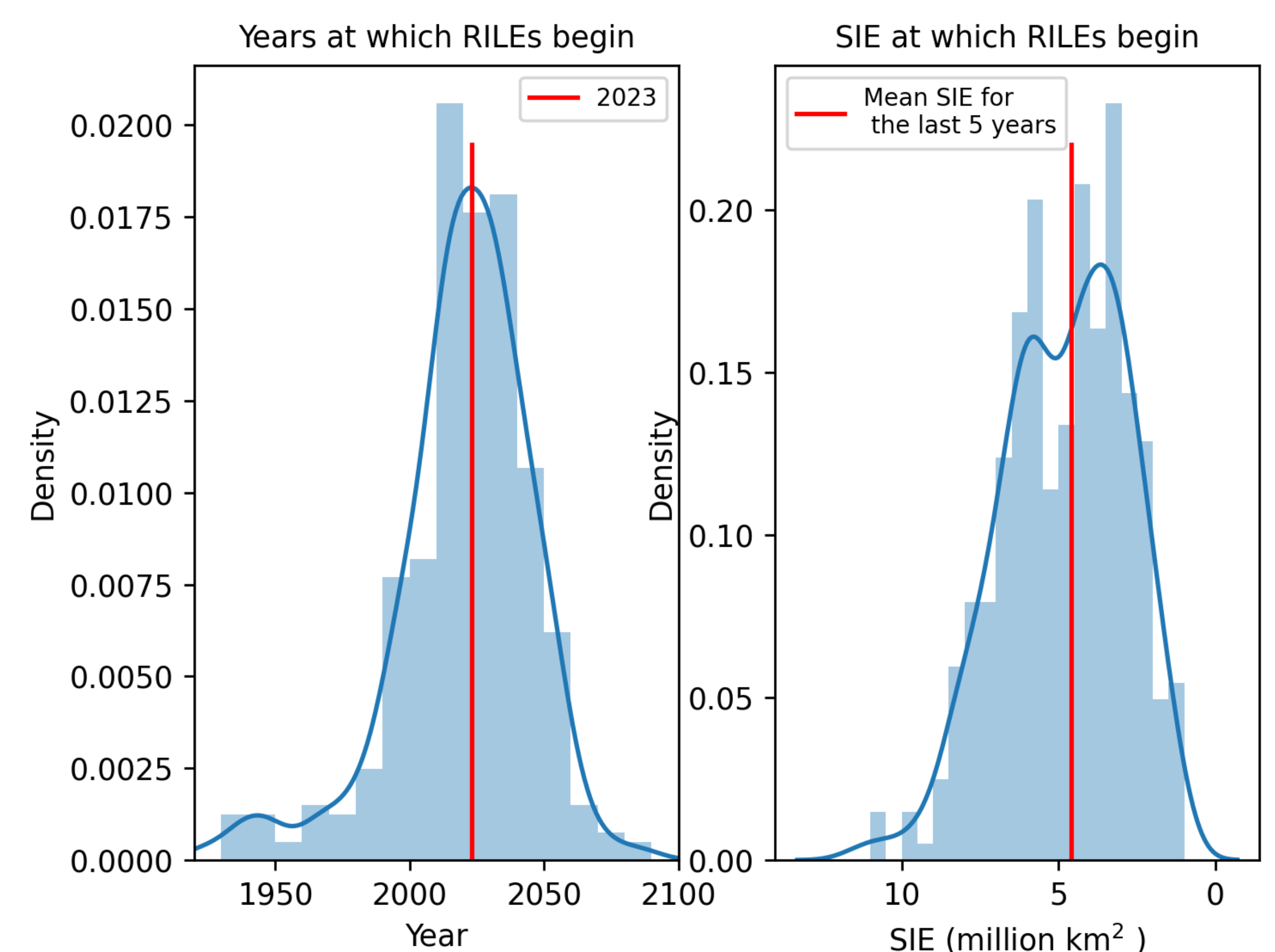


Density of the number of RILEs occurring in CMIP6 members during September per model using SSP585 scenario. The number of members for each model is indicated in brackets.

They last mostly **between 4 and 6 years** but can go on more than 15 years. Over a **fifth of RILEs** reach **ice-free ocean** conditions by the end of the event.

## Can we predict a RILE based on the climatology of the RILEs' distribution in such ensembles?

- The frequency of RILEs increases as the Arctic sea ice extent diminishes,
- the probability of observing a RILE is highest during the period from 2015 to 2040,
- the observed September Arctic SIE is approaching the value corresponding to the peak of probability of occurrence of RILEs.



Density of the years at which RILEs begin (left) and of the SIE at which RILEs begin (right) during September in CMIP6 models using SSP585 scenario.

**This suggests that we may be on the verge of a RILE, following a slowdown since the early 2010s.**

## Aims

In the future, we plan to **identify the climatic conditions** that are favorable for the formation of RILEs, with the goal of **predicting** the probability of their occurrence in real-time by using EC-EARTH. We also aim to study **the impacts** of these rapid ice loss events on the wider climate system.

Scan here for some abstract information

