

Barcelona, 10-12 December 2014

International workshop on polar-low latitude linkages
and their role in weather and climate prediction



Sea ice prediction 103

François Massonnet

with valuable input and discussions from

C. M. Bitz, E. Blanchard-Wrigglesworth, , M. Chevallier,
J. J. Day, V. Guemas, S. Howell, J. Stroeve, S. Tietsche

The sea ice prediction lectures series continues

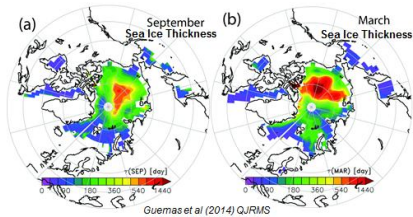
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Virginie Guemas



I - Arctic sea ice predictability sources

Persistence



- Sources of predictability
- Importance of initialization
- 2-model prediction

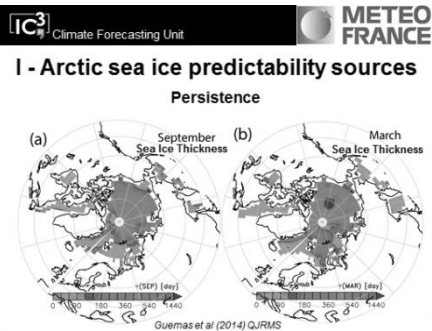
The sea ice prediction lectures series continues

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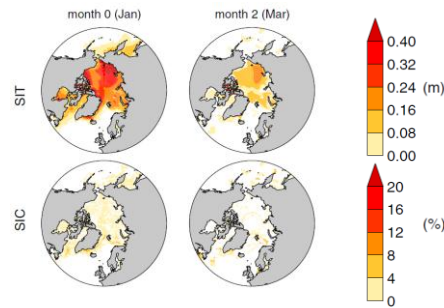
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Jonny Day



- Sources of predictability
- Importance of initialization
- 2-model prediction
- Potential predictability
- Importance of thickness
- Initialization date



The sea ice prediction lectures series continues

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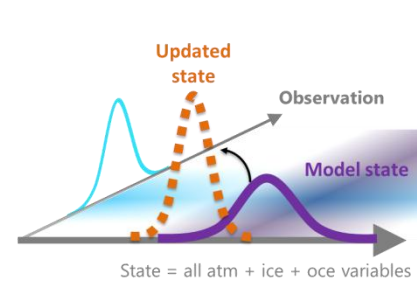
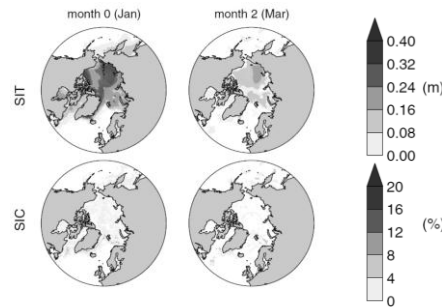
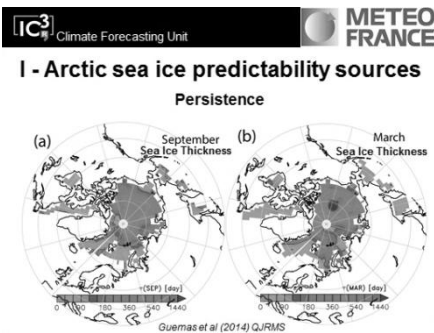
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- Sources of predictability
- Importance of initialization
- 2-model prediction
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- Importance of thickness
- Initialization date
- Data assimilation
- Seasonal prediction
- Estimation of uncertainty

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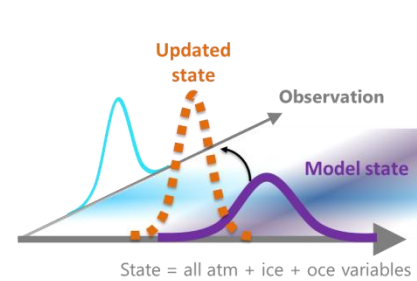
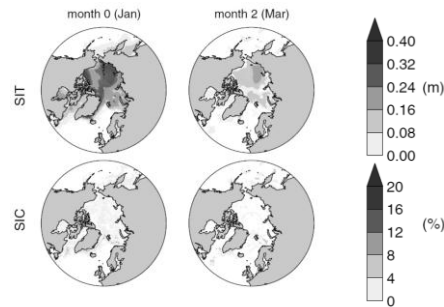
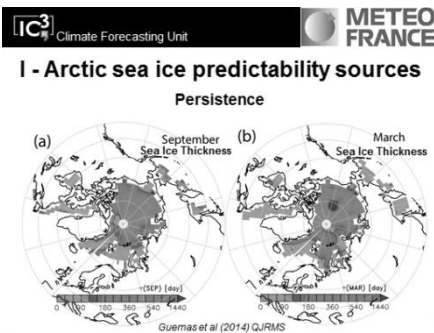
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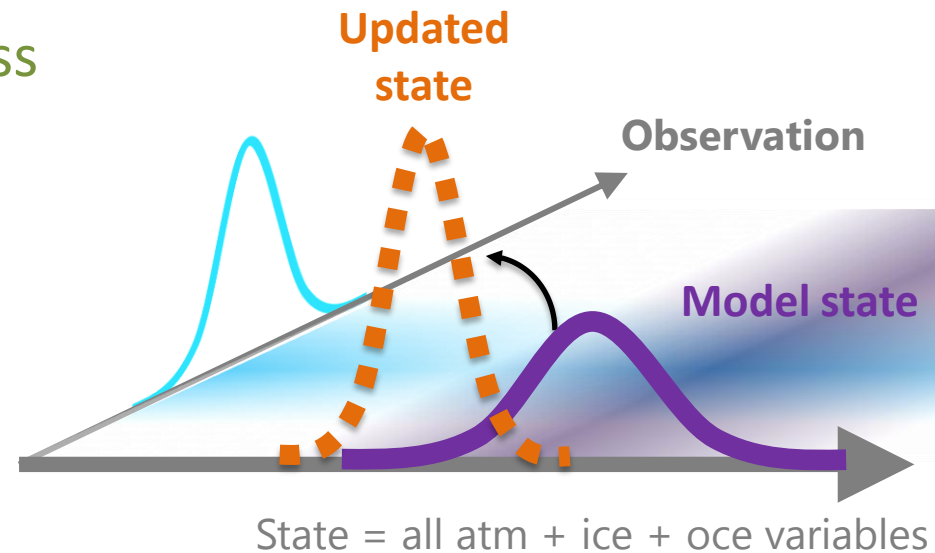
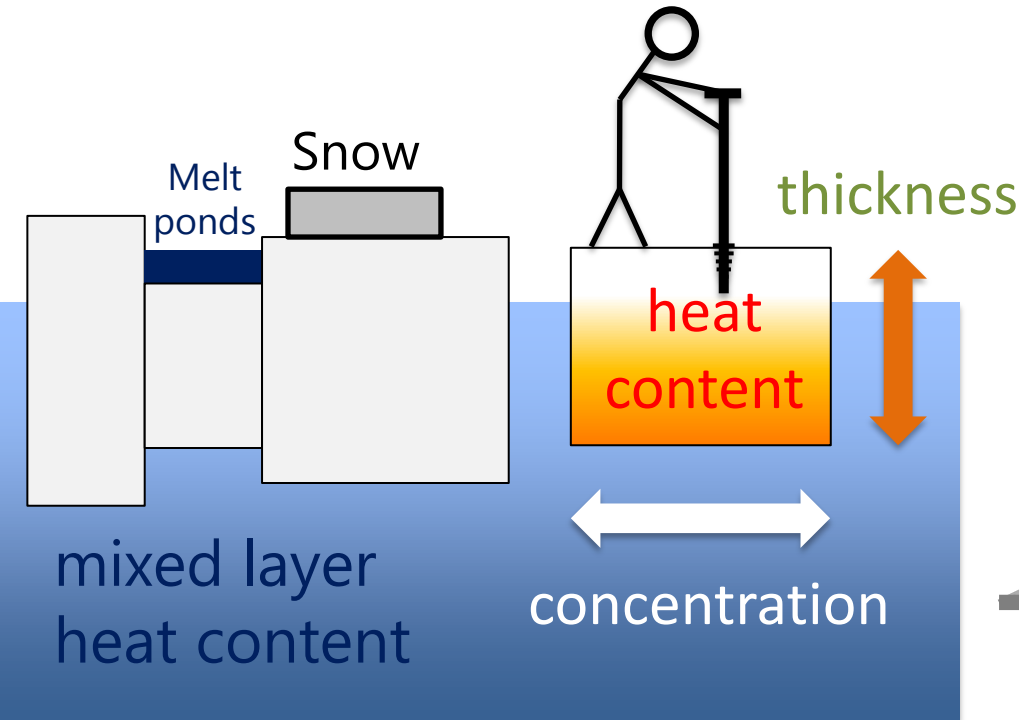
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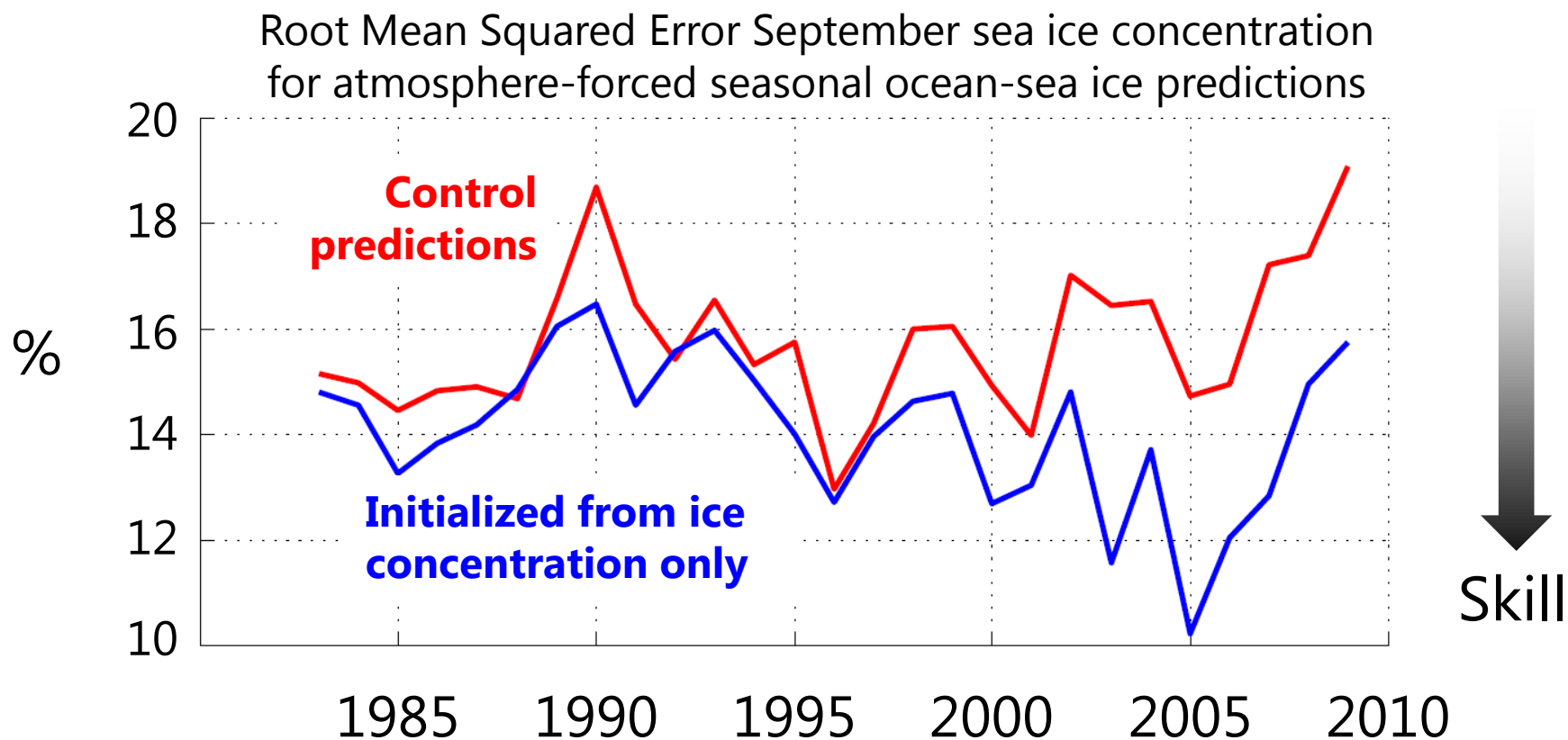


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- **Data assimilation**
- Seasonal prediction
- Estimation of uncertainty

The 0th principle of data assimilation :
update the whole state given incomplete observations



Sea ice data assimilation is ready for seasonal-to-decadal prediction



The sea ice prediction lectures series

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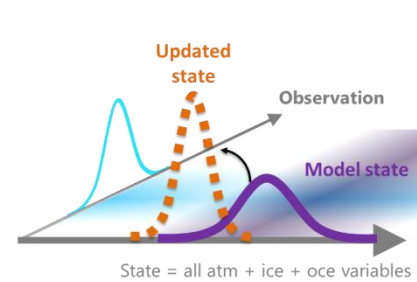
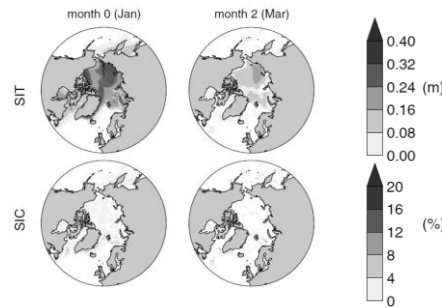
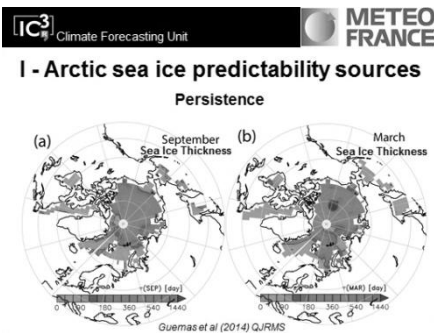
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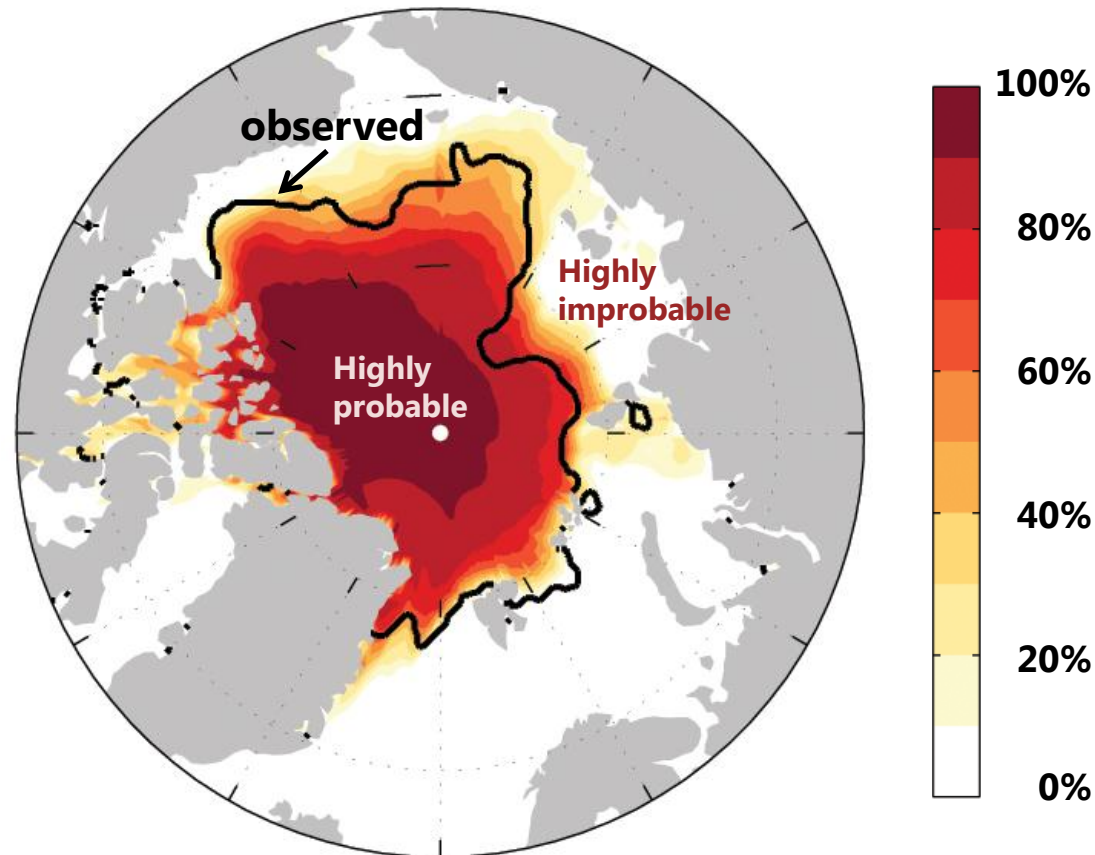
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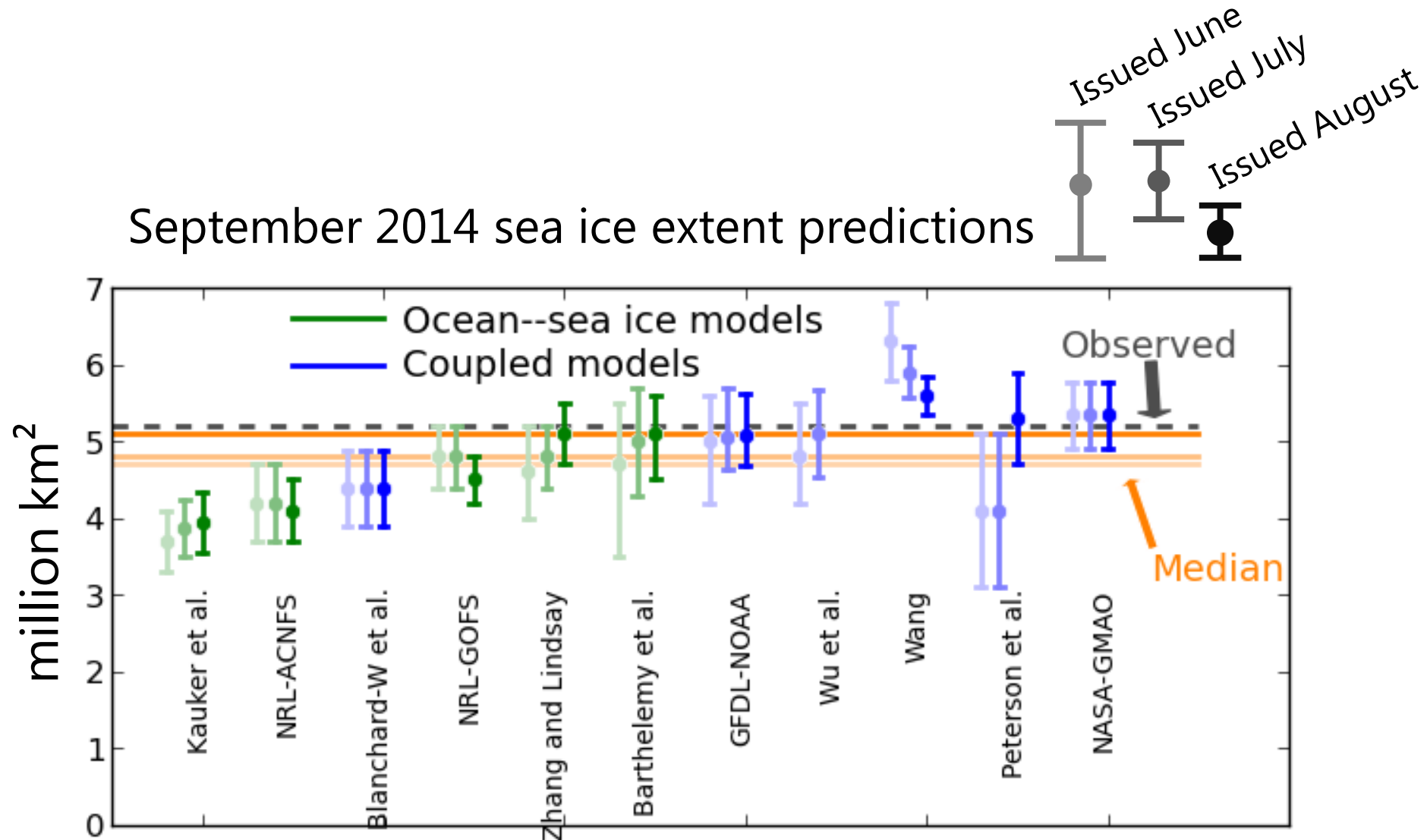
SIPN – Sea ice Prediction Network: Manage and analyze sea ice outlooks

Probability of sea ice presence
(September 2014, 5 models)



Model-based seasonal predictions: consistent individual and collective behaviors

September 2014 sea ice extent predictions



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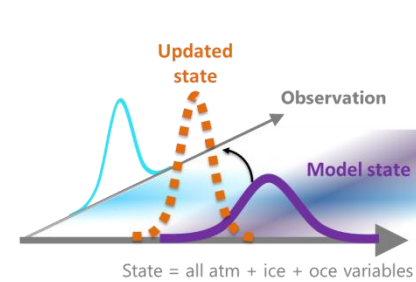
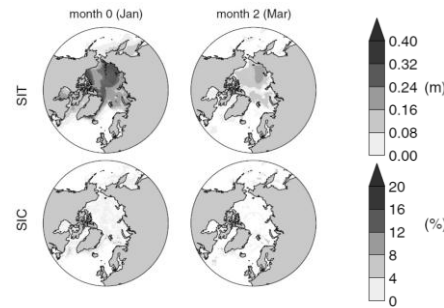
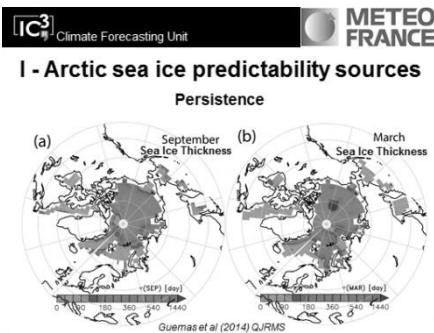
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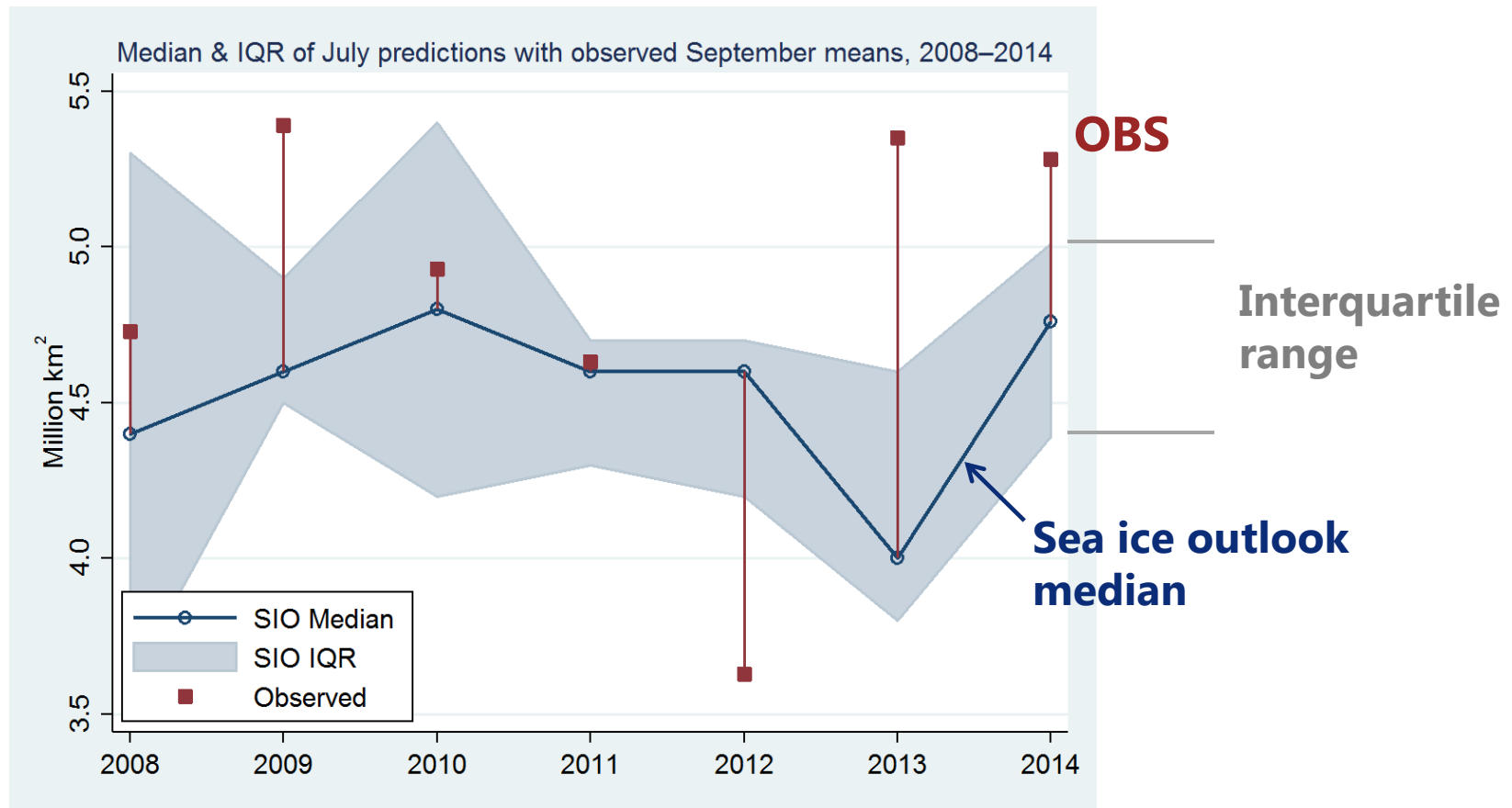
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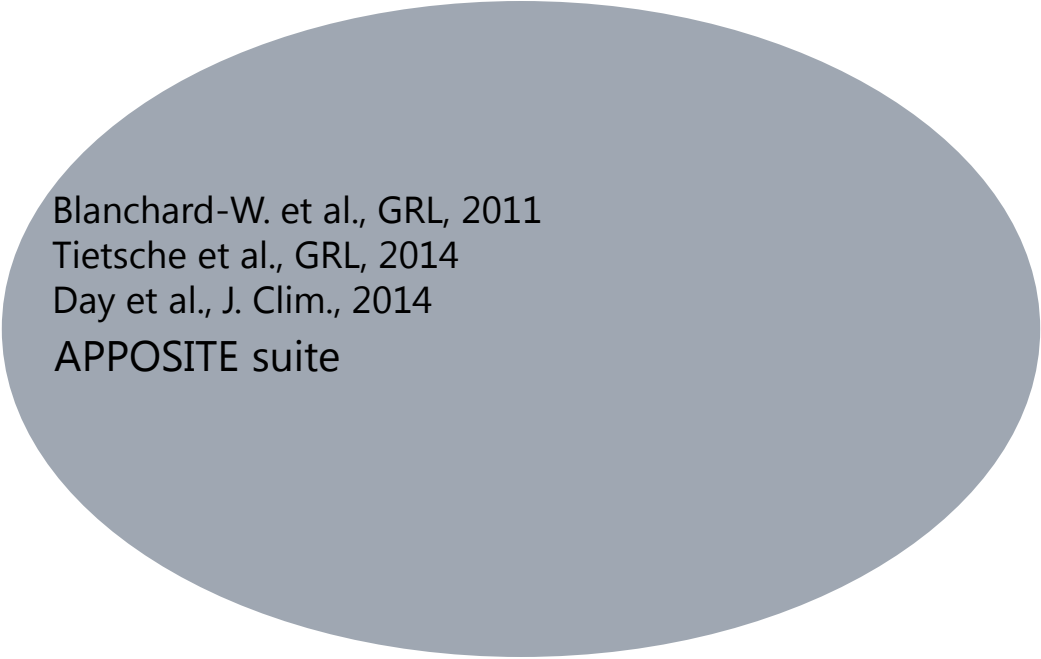
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- **Estimation of uncertainty**

Is the current generation of sea ice outlooks overconfident? Yes, probably.



Why do model predictions diverge from each other?

**Because of chaotic
atmospheric fluctuations**

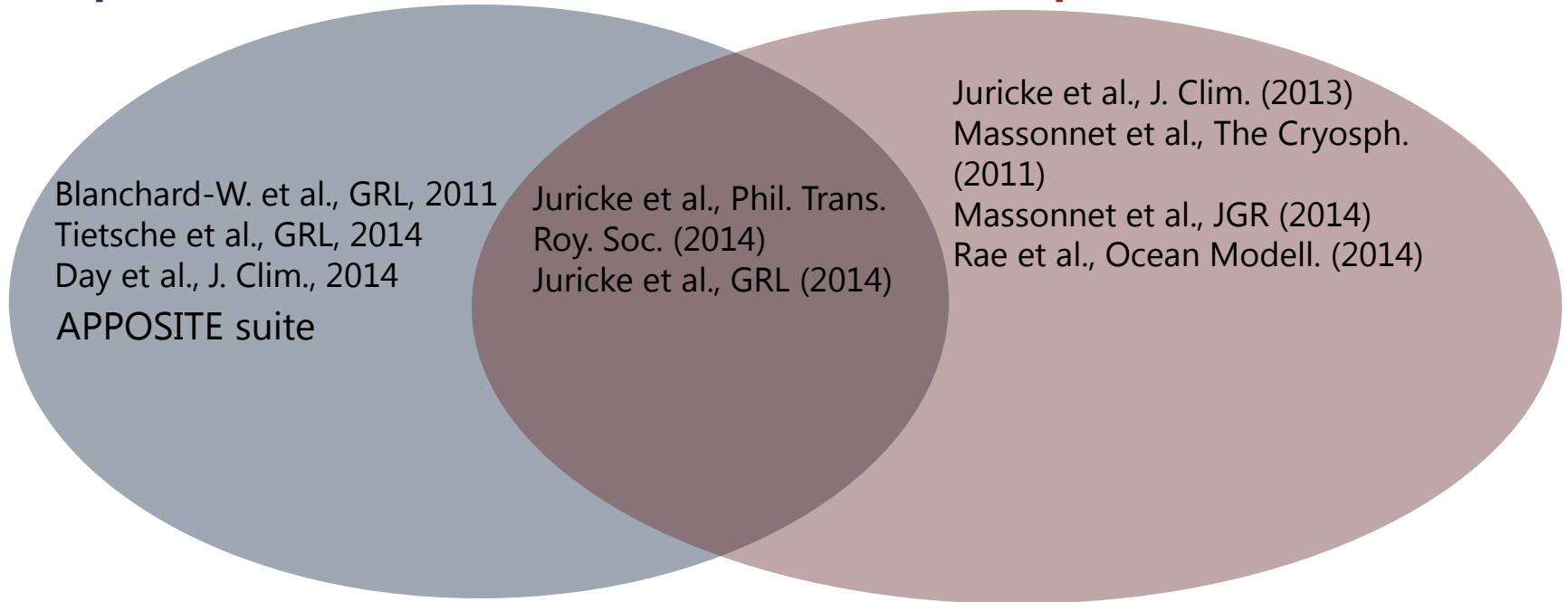


Blanchard-W. et al., GRL, 2011
Tietsche et al., GRL, 2014
Day et al., J. Clim., 2014
APPOSITE suite

Why do model predictions diverge from each other?

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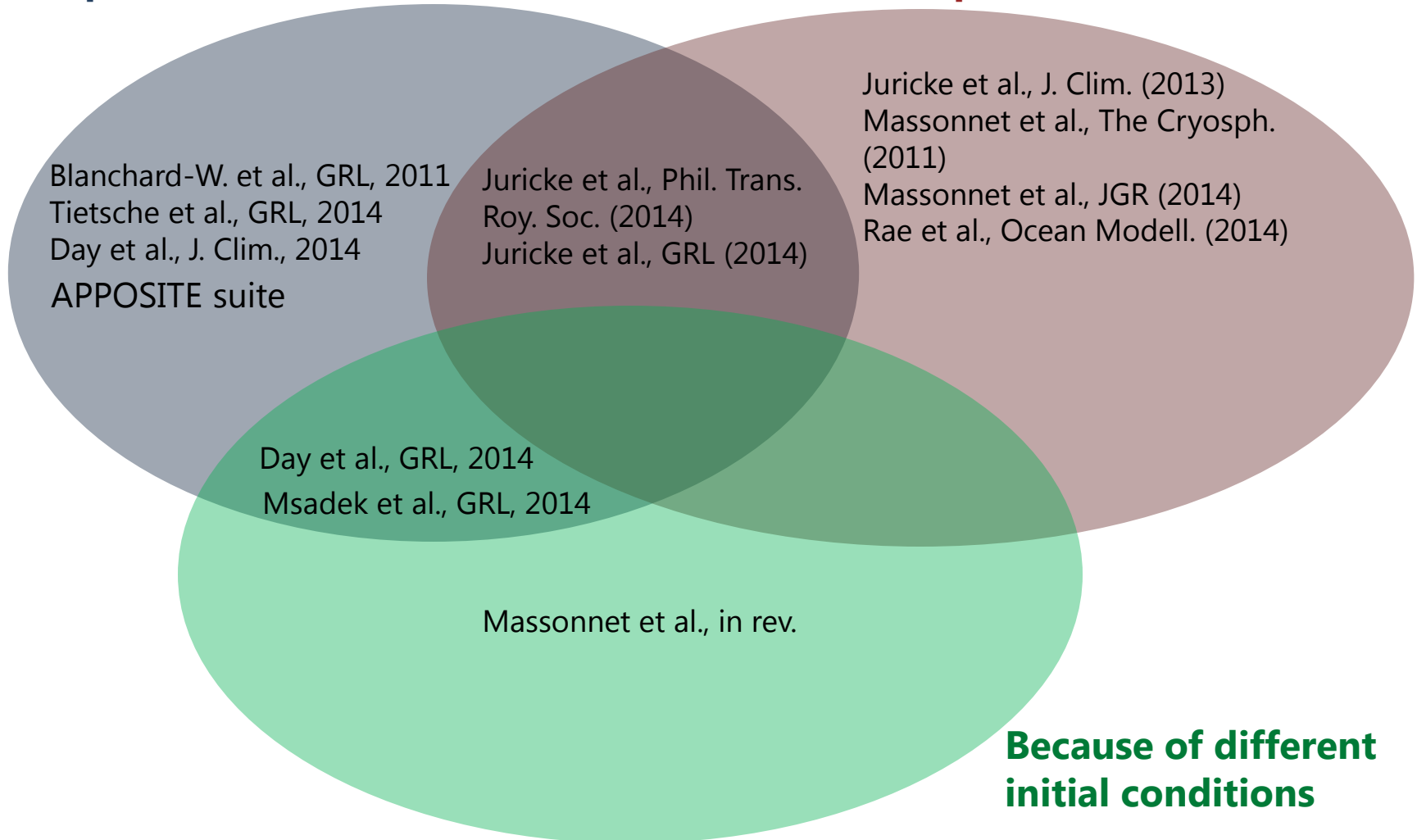
**Because model physics and
parameters are different**



Why do model predictions diverge from each other?

Because of chaotic atmospheric fluctuations

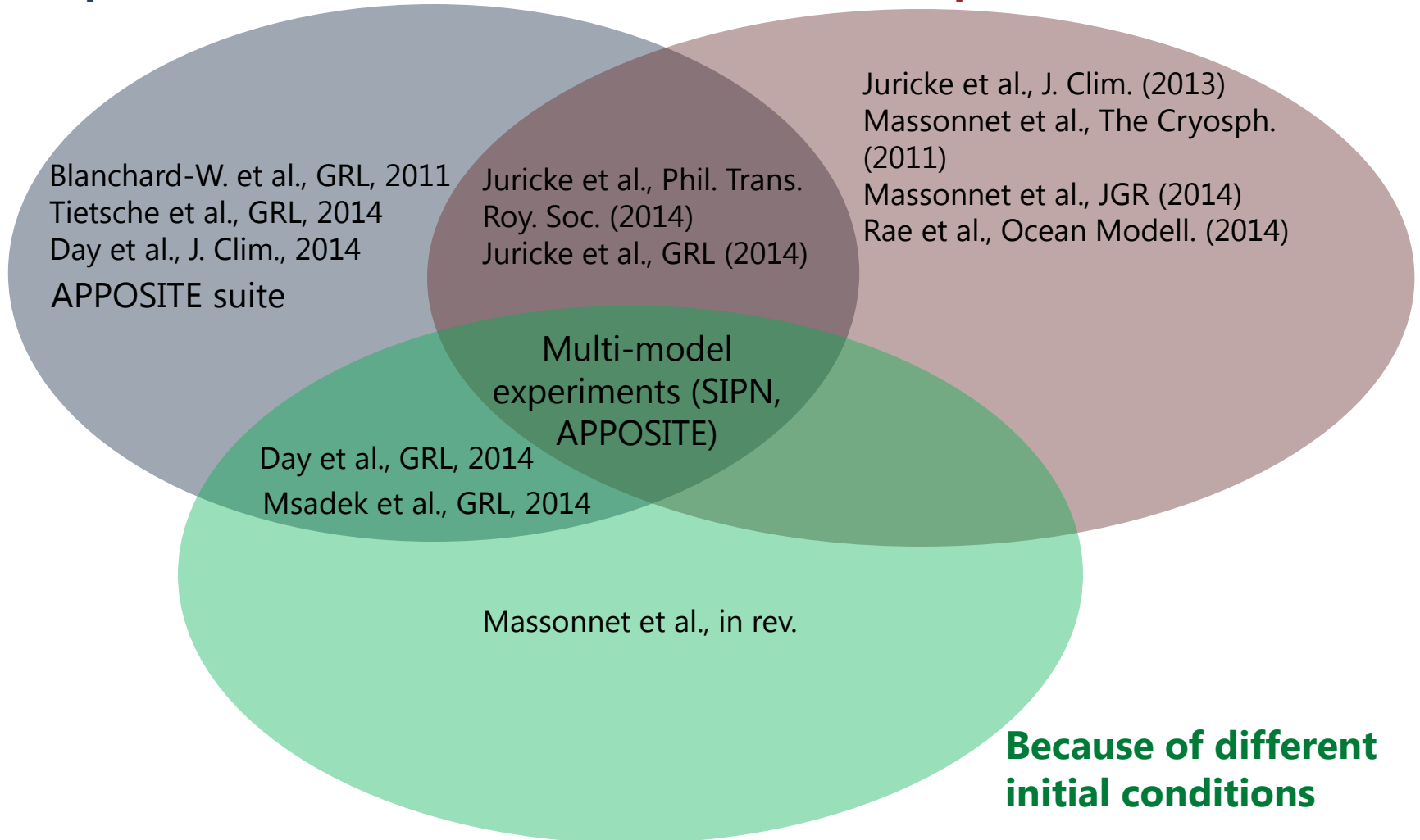
Because model physics and parameters are different



Why do model predictions diverge from each other?

Because of chaotic atmospheric fluctuations

Because model physics and parameters are different



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Lessons learned & directions

Lessons learned

Open questions

Data assimilation

Appropriate for sea
ice initialization

How to handle
coupled initialization?

Seasonal sea ice
prediction

Joint efforts exist, skill still
to be demonstrated

Can we expect skill in a
changing climate? What are
user-relevant diagnostics?

Estimation of
uncertainty

Predictions probably
overconfident

How can we reevaluate
uncertainty properly?

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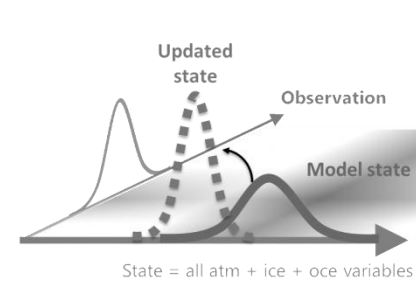
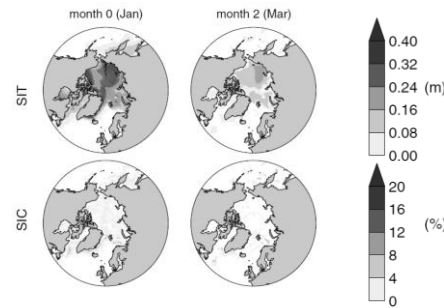
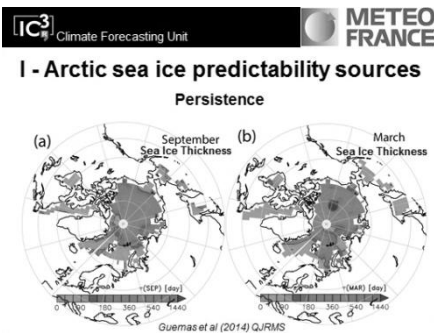
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François Massonnet

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Matthieu Chevallier



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- Data assimilation
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- Seasonal prediction
- Operational forecasts
- Users needs

Thank you!

francois.massonnet@uclouvain.be

www.climate.be/u/fmasson



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