

Sunlight and thin sea ice

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What — Why — How — Where

What — Why — How — Where



Solar radiation reflected
from and passing through
thin sea ice; (JGR paper,
revising at the moment)

Thinner, more seasonal ice;
energy budget of Arctic;
not many earlier studies

What — Why — How — Where

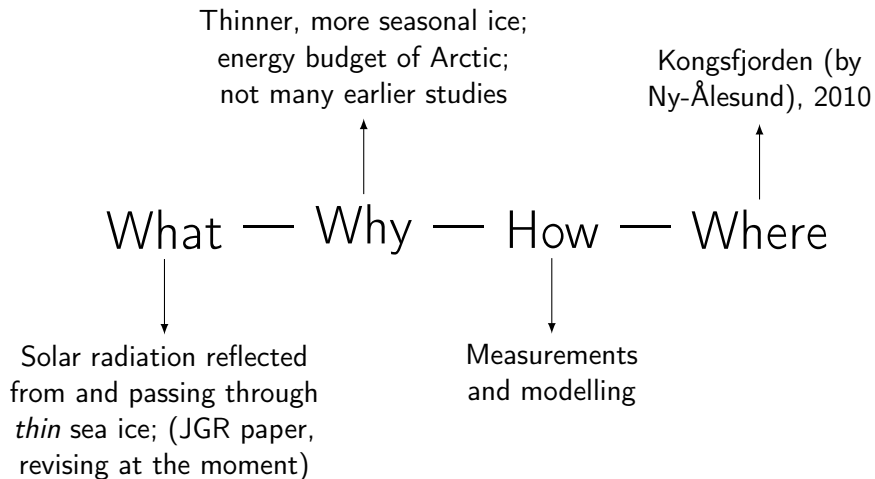
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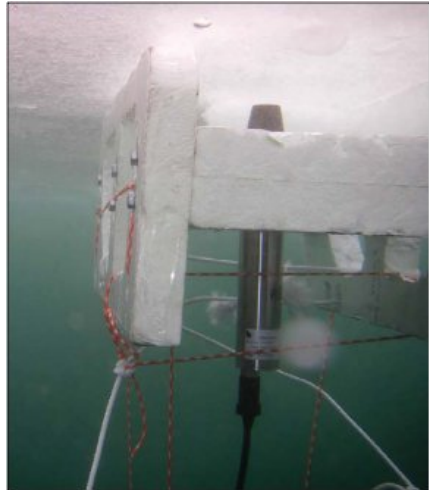
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Measurements
and modelling



Collecting observations





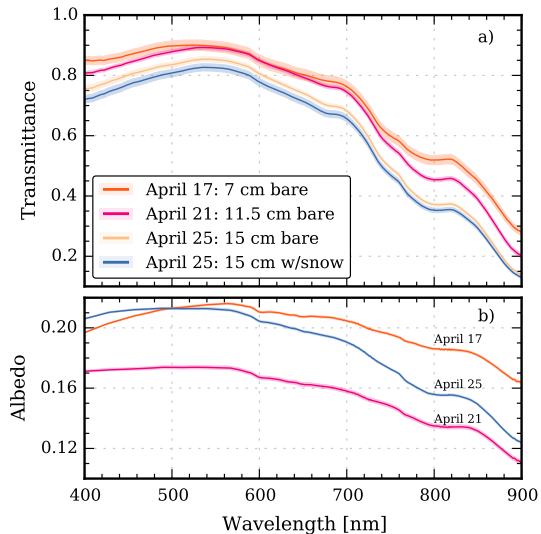
Collecting observations



- Transect repeated on three days in 2010, April 17, 21 and 24.
- Ice samples collected for melting and filtration → absorption coefficients
- Ice grew from 7 cm to 15 cm

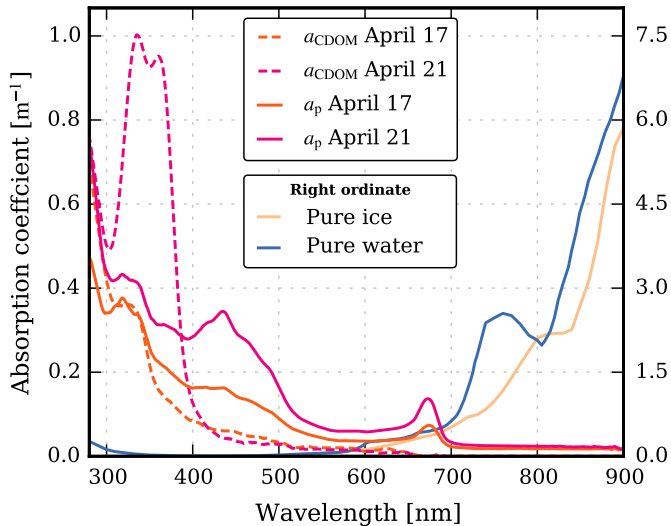


Observations – transmittance and albedo



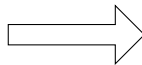
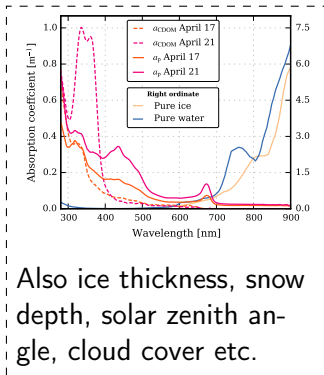


Observations – absorption coefficients





Modelling

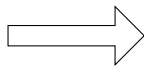
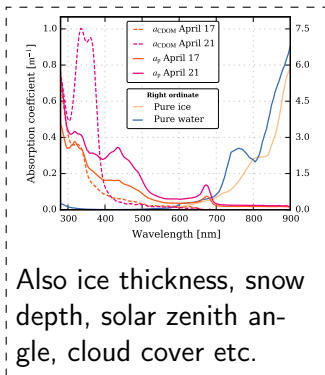


AccuRT

“Accurate Radiative Transfer”



Modelling



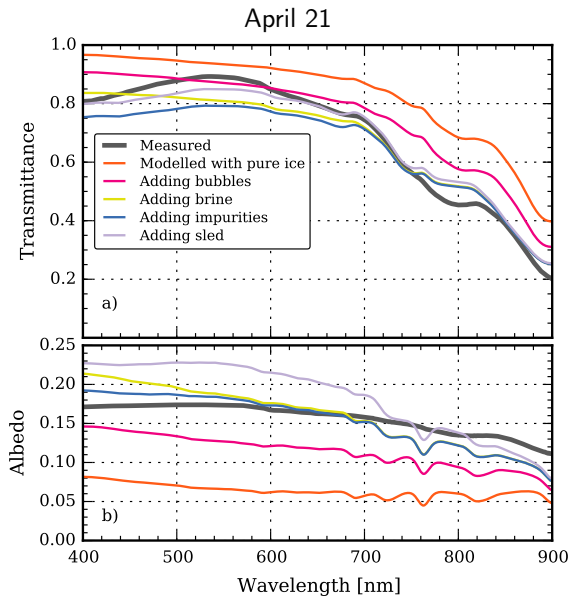
AccuRT

“Accurate Radiative Transfer”

- Plane-parallel model (1D)
- Coupled atmosphere–ocean
- Standard atmosphere + clouds
- For ice: Specify brine and air volume, pocket and bubble size.

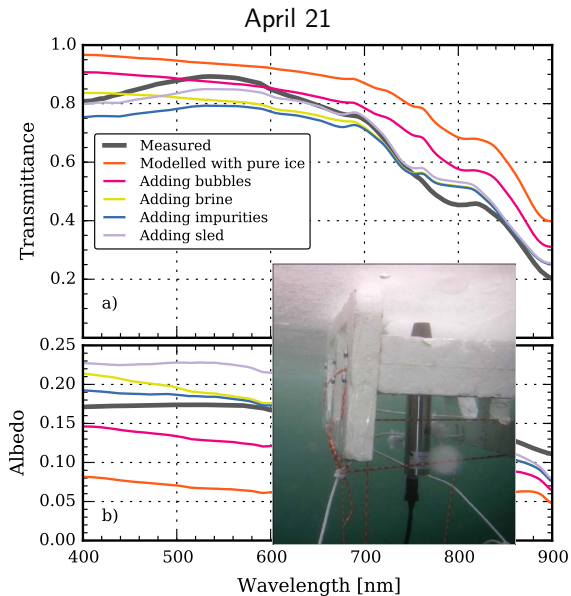


Effect of different constituents



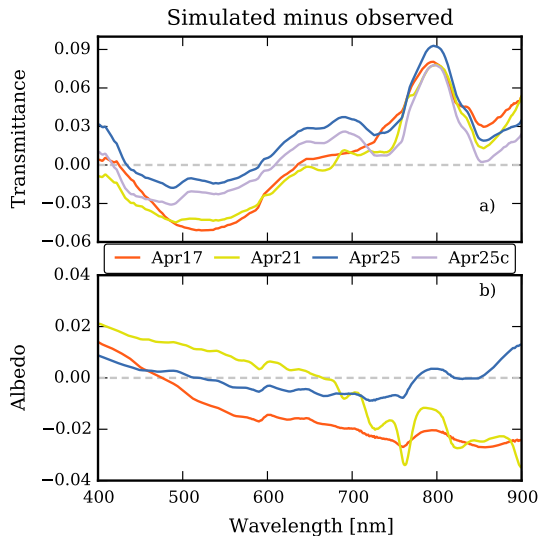


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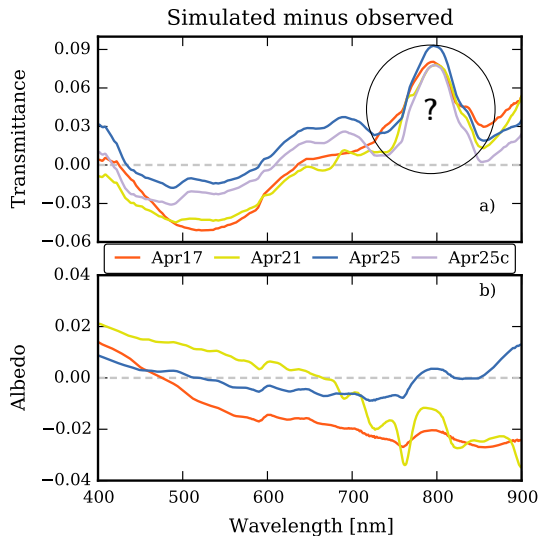


Compared to observations



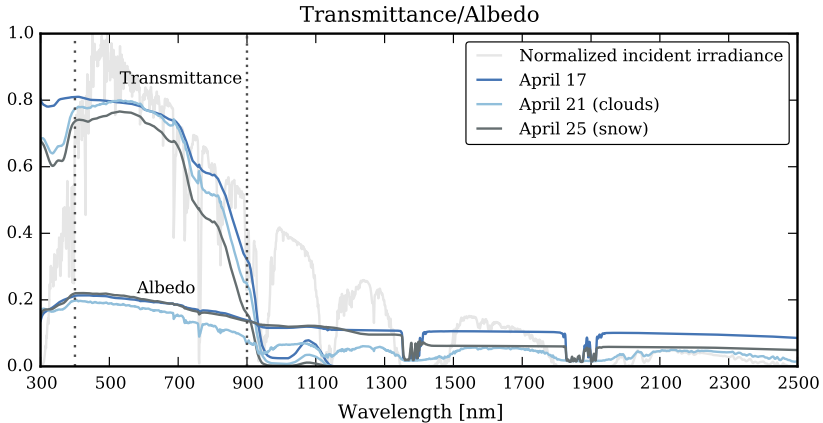


Compared to observations





What about longer wavelengths?



- Total transmittance 0.51 on average
- Albedo is 0.16

So ... some comments



- Clouds change things
- Very simple description of ice (one layer)
- Modeling indicates high brine volume (40%)
 - Not unheard of
 - Ice temperature and salinity gives¹ about 13%
- But this isn't too bad.

¹G. F. N. Cox and W. F. Weeks (1983). "Equations for determining the gas and brine volumes in sea-ice samples". In: *Journal of Glaciology* 29, pp. 306–316.

Some challenges

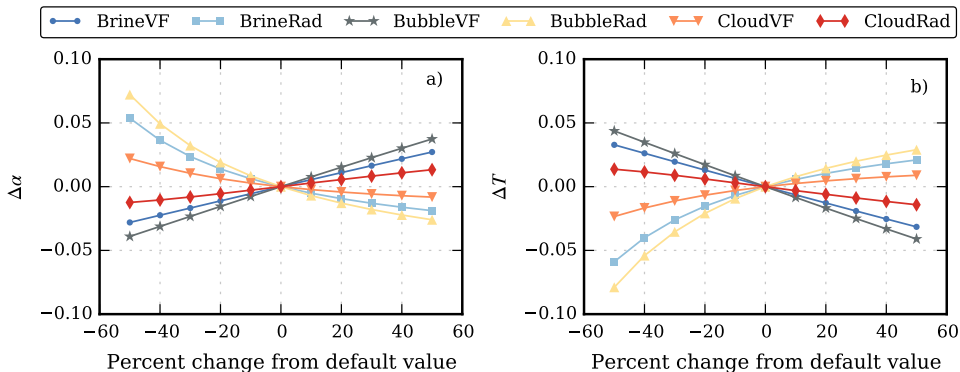


- Many different parameters in sea ice alone
 - Affects albedo/transmittance differently



Some challenges

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Some challenges



- Many different parameters in sea ice alone
 - Affects albedo/transmittance differently
- We don't really know what happens around 800 nm.
- The underice sled is an unknown factor

All in all ...



- Still unanswered questions
- All things considered, simulations aren't too bad
- Hopefully useful study in broader sense as well

That's all folks.

Thanks for listening!