

Longwave coupling in the polar regions

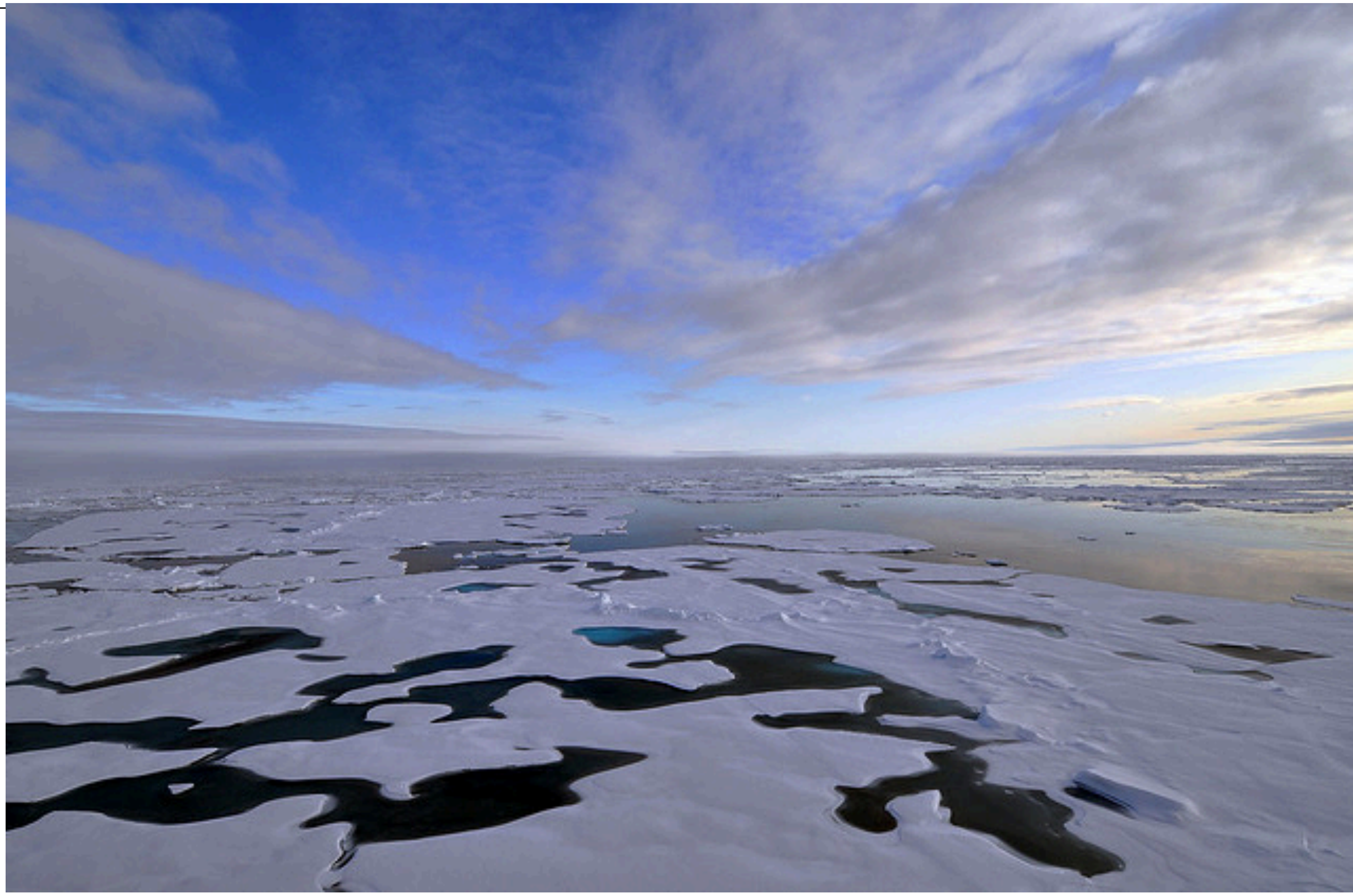
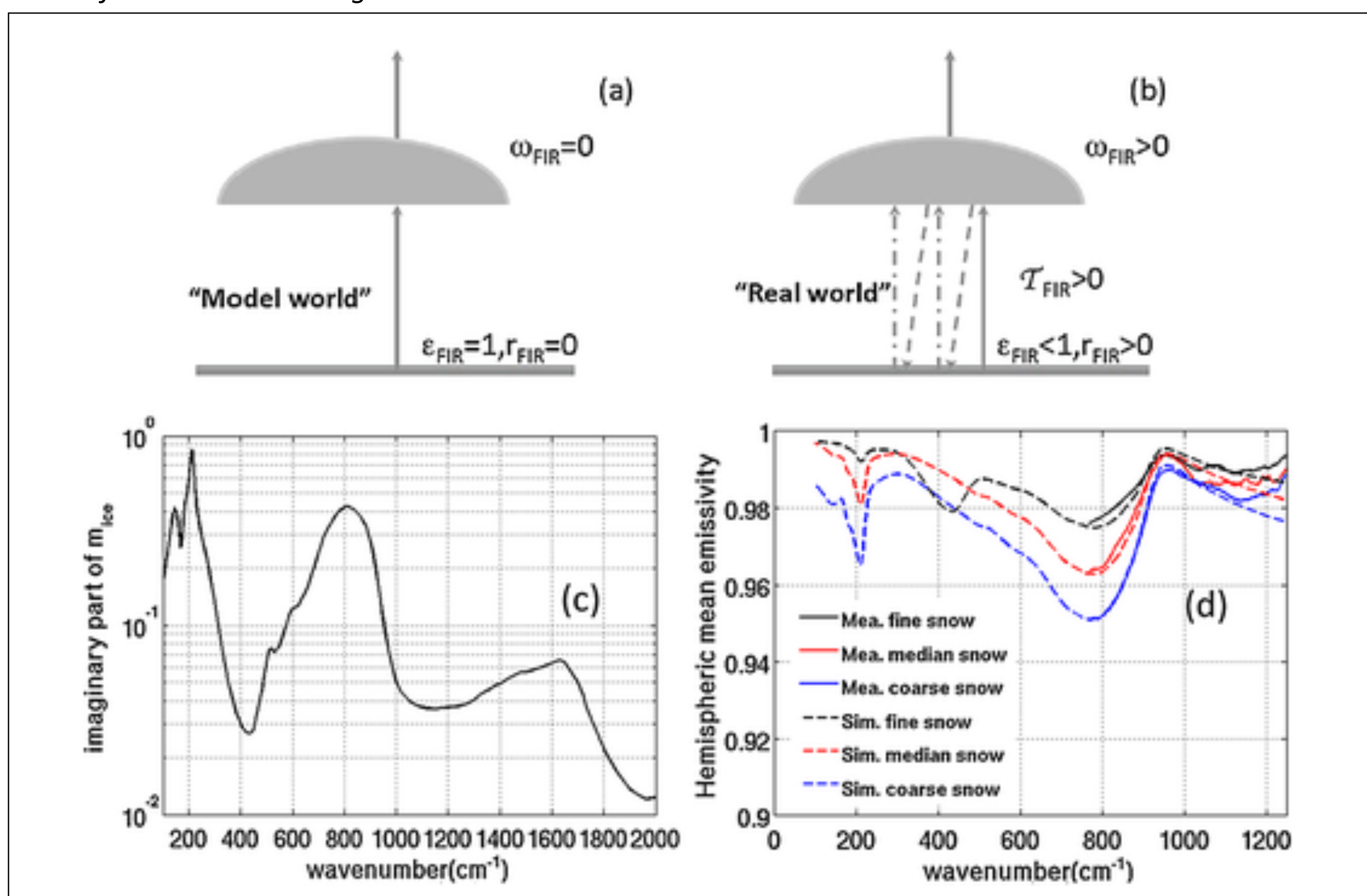


Photo from NSIDC showing the clouds and sea ice in Arctic

- In reality, radiative transfer is spectrally dependent.
- LW radiative transfer is coupled between atmosphere and surface components. No model so far has faithfully treated this coupling.
- Two issues stand out in polar regions
 - Surface spectral emissivity (ϵ_s)
 - Cloud scattering
- Among all CMIP5 models
 - None got ϵ_s right: **blackbody assumed**
 - Only three models considered LW scattering: **cloud assumed absorptive only**
 - How wrong these assumptions could be?



Schematic illustration of current model vs. reality for missing processes in the surface-atmosphere LW coupling (based on Fig. 2 in Chen et al., 2014)

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