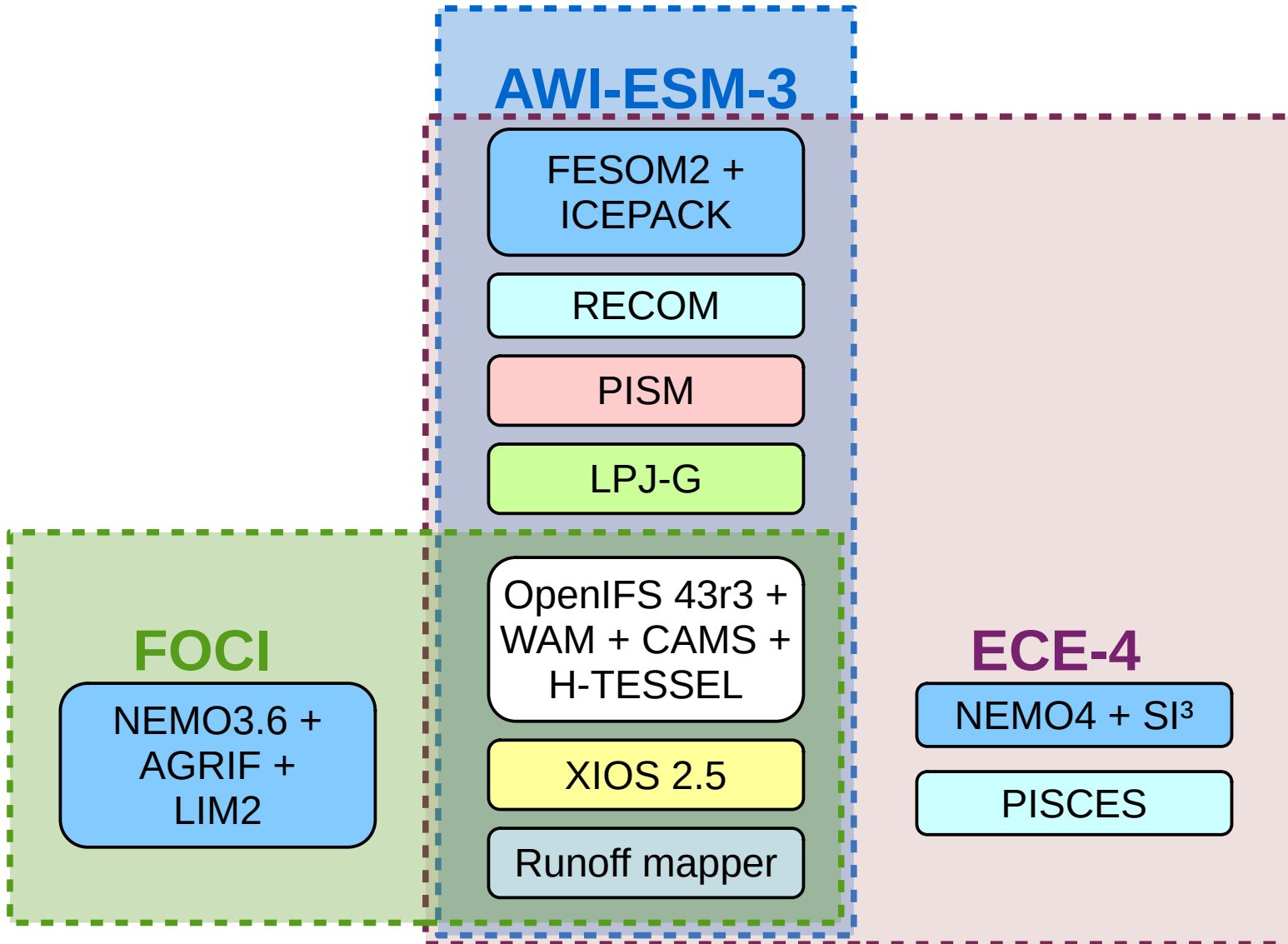


Past, present, and future advances in AWICM3 coupling

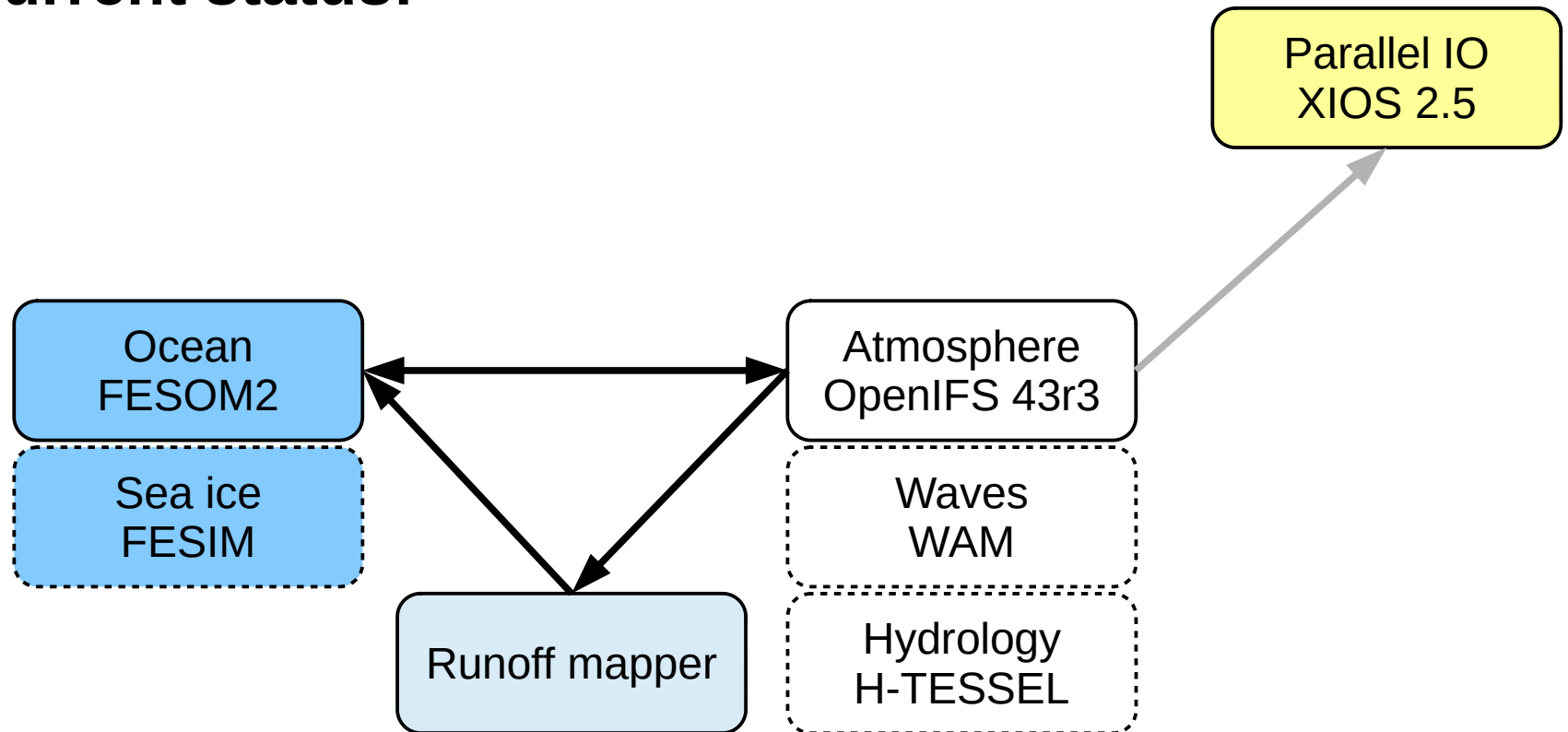
Jan Streffing 07.12.2020

Longterm plan



Coupling schematic

Current status:



Coupling fields

ATM → OCE

Non-solar heat to ocean

Short wave radiation to ocean

Total heat to ocean

Total heat to sea ice

Liquid precipitation

Solid precipitation

Evaporation from ocean

Sublimation from sea ice

Zonal momentum to ocean

Zonal momentum to sea ice

Meridional momentum to ocean

Meridional momentum to sea ice



Coupling fields

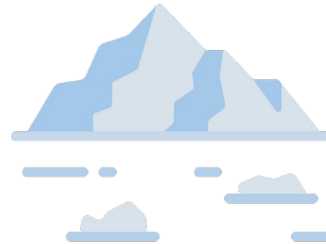
OCE → ATM

Sea surface temperature

Sea ice concentration

Snow thickness

Sea ice thickness



Coupling fields

OCE → ATM

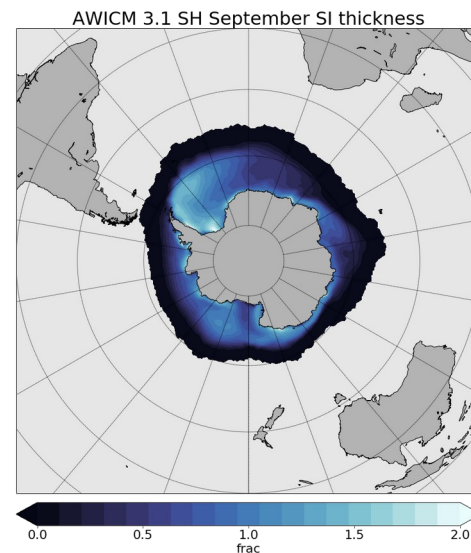
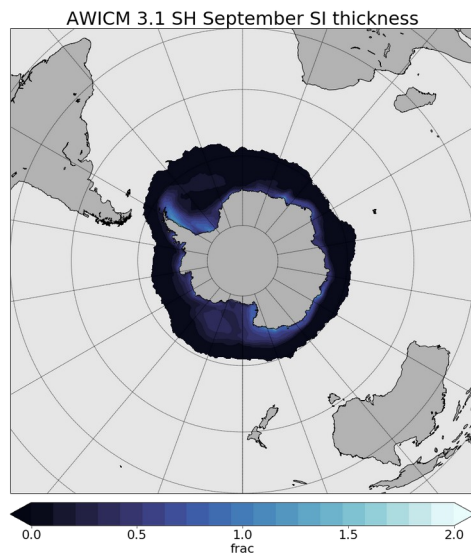
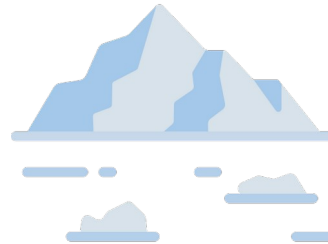
Sea surface temperature

Sea ice concentration

Snow thickness

Sea ice surface temperature

Sea ice albedo (broadband)



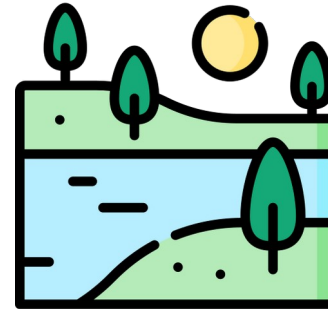
Coupling fields

ATM → RNF

Precipitation – Evaporation (land)

RNF → OCE

Runoff



Coupling fields

ATM → RNF

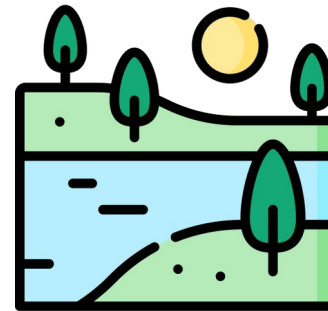
Precipitation – Evaporation (land)

Surface mass balance

RNF → OCE

Runoff

Calving & Basal melting

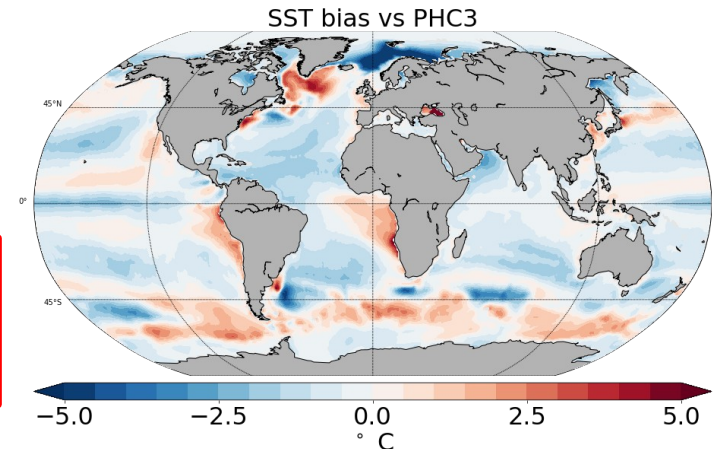


Greenland surface mass balance:

$$338 \text{ [GT/y]} = 10,7 * 10^9 \text{ [g/s]}$$

$$E = 10,7 * 10^9 \text{ [g/s]} * 333,55 \text{ [J/g]} = 3,6 * 10^{12} \text{ [W]}$$

$$F = 3,6 * 10^{12} \text{ [W]} / 1,4 * 10^{12} \text{ [m}^2\text{]} = 2,5 \text{ [W/m}^2\text{]}$$



SMB from: (Fettweis et al. 2020 <https://doi.org/10.5194/tc-14-3935-2020>)

Further construction zones



Conservative remapping	<ul style="list-style-type: none">- Currently Oasis3MCT4 global flux residual redis.- Dimitry Siderenko implemented bespoke AWICM1/2 conservation for AWICM3- EC-Earth (BSC) looking into locally conservative Oasis remapping
Ocean velocity coupling	<p>Improvement of:</p> <ul style="list-style-type: none">- Surface roughness parametrization- Drag coefficient parametrization- Surface momentum flux calculation
Stochastic coupling	<ul style="list-style-type: none">- Reduce loss of information when coupling at high ocean/atmosphere grid ratio- Implementation of work done by T. Rackow.