

NEMO Users Meeting  
7-8th July 2014



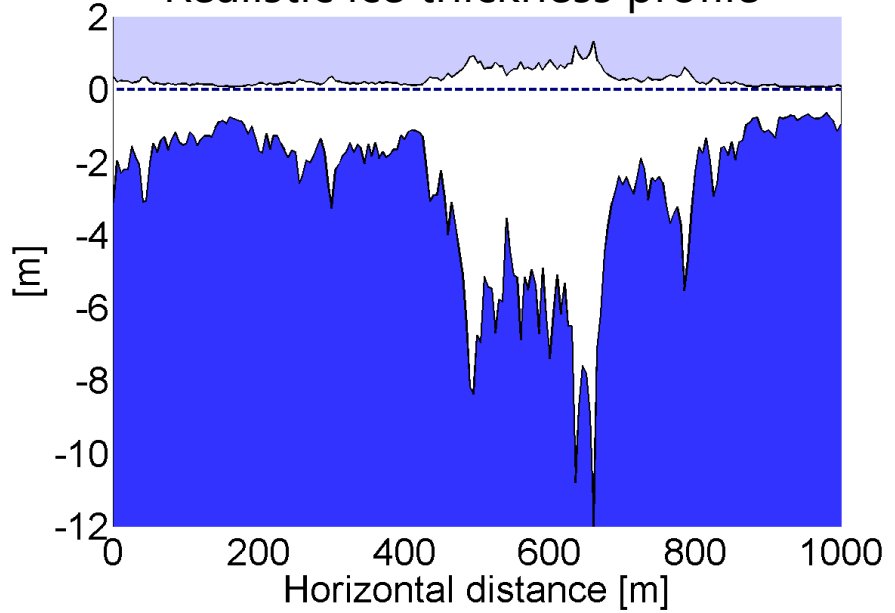
# Future of the Louvain-la-Neuve sea ice model (LIM)

François Massonnet

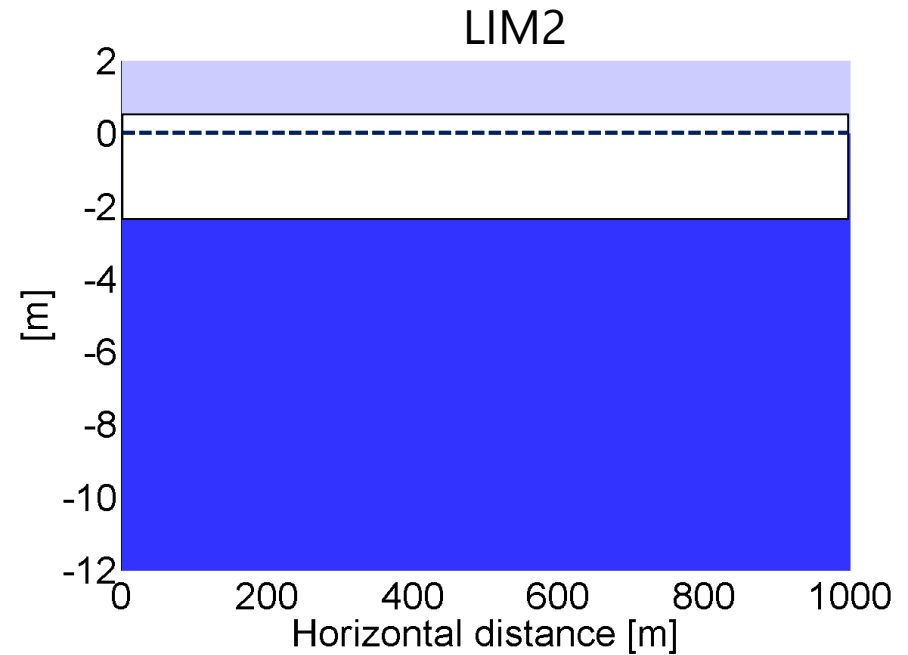
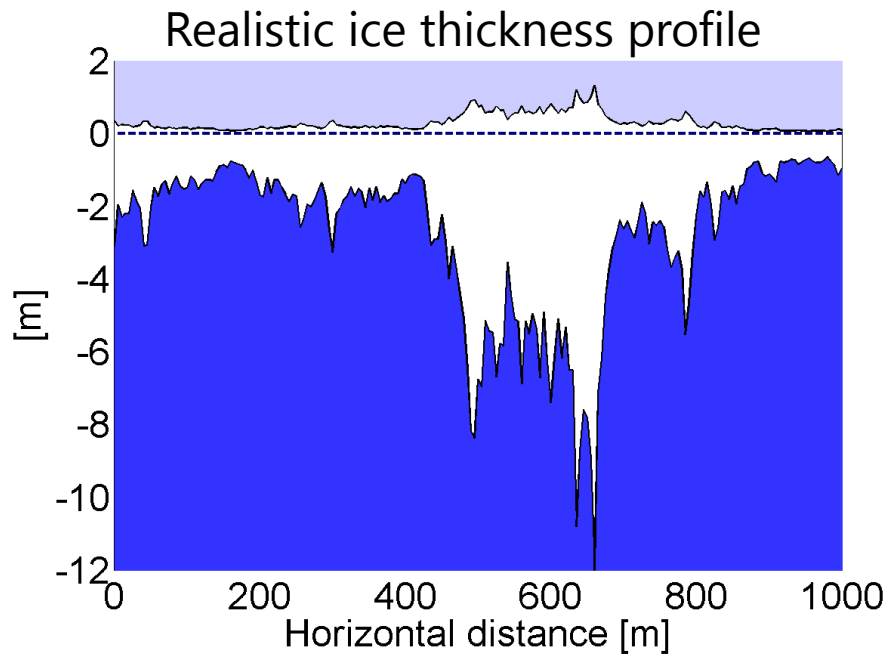


A. Barthélemy • S. Bouillon • T. Fichefet • H. Goosse  
O. Lecomte • S. Moreau • A. Pestiaux • J. Raulier  
R. Stevens • M. Vancoppenolle • G. Vergé-Dépré

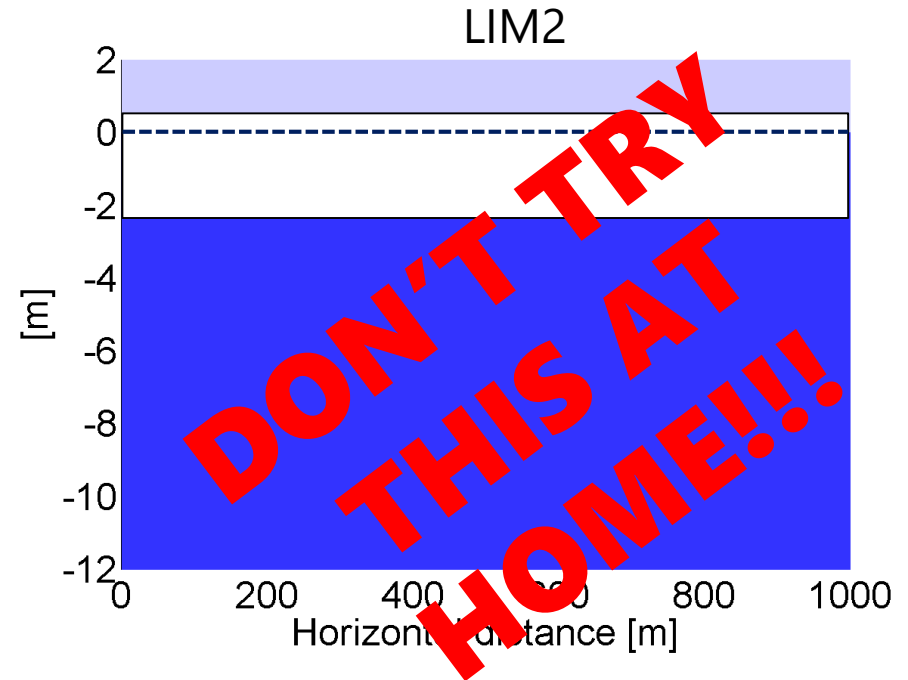
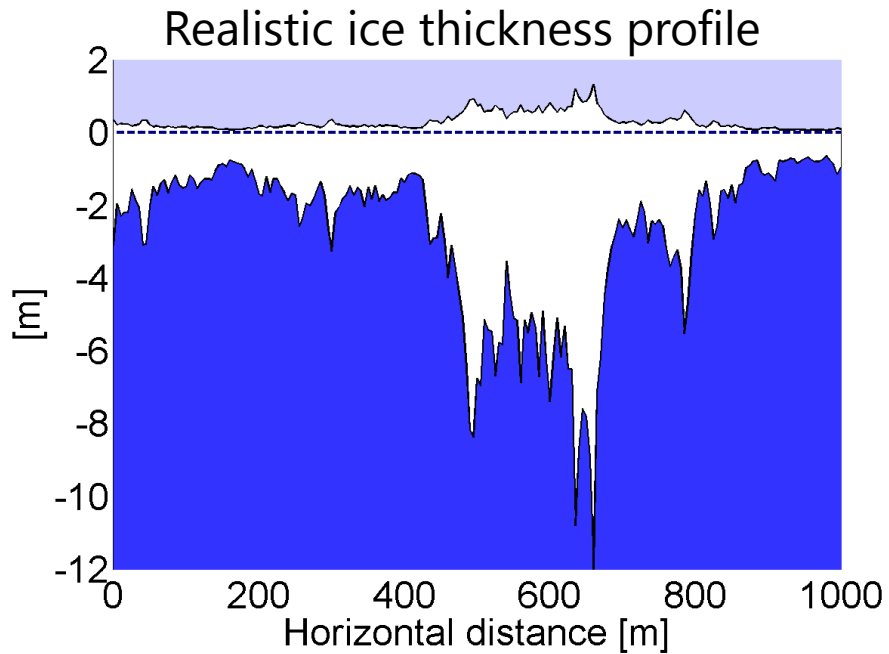
Realistic ice thickness profile



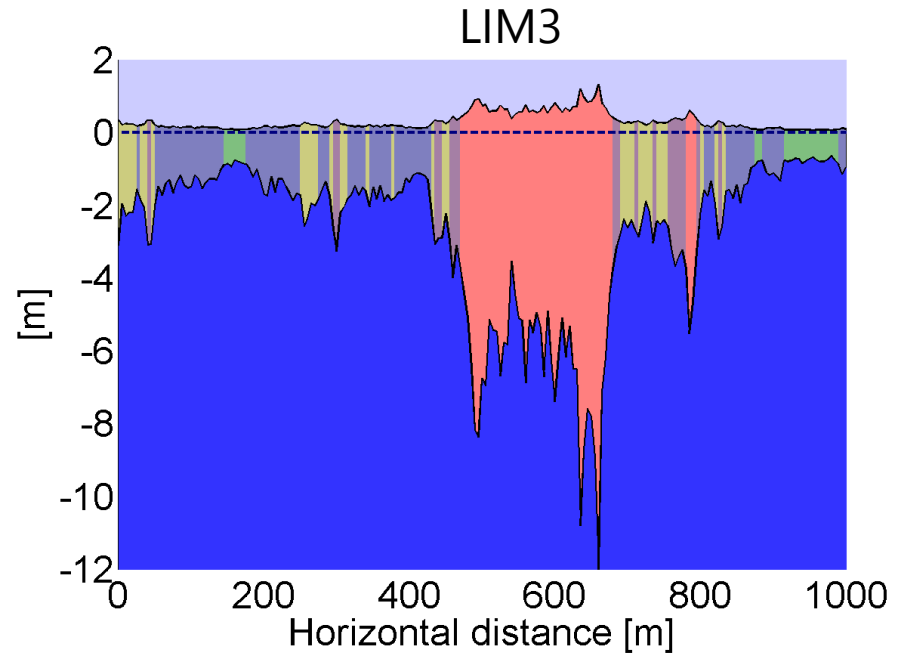
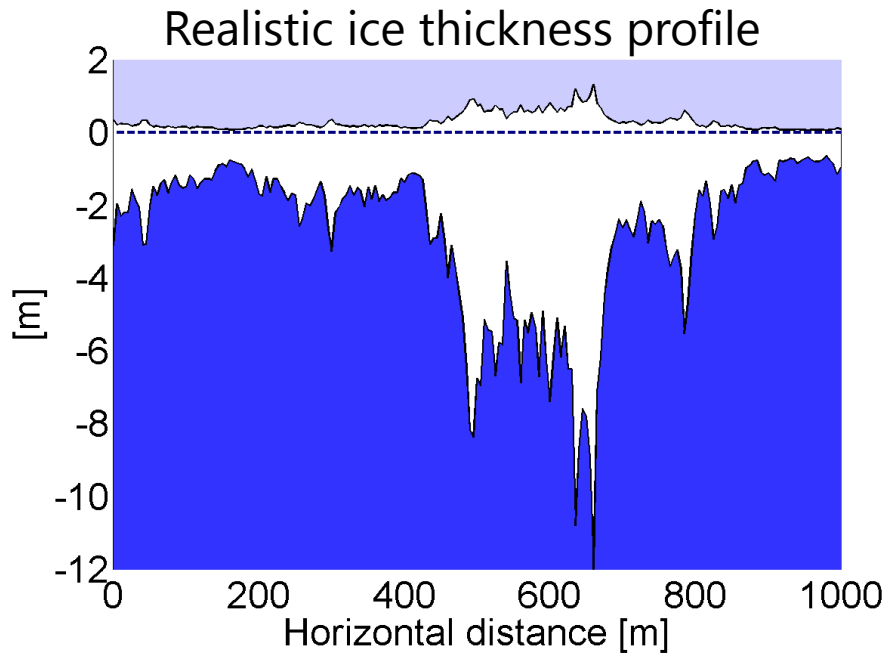
# How the LIM looked like yesterday



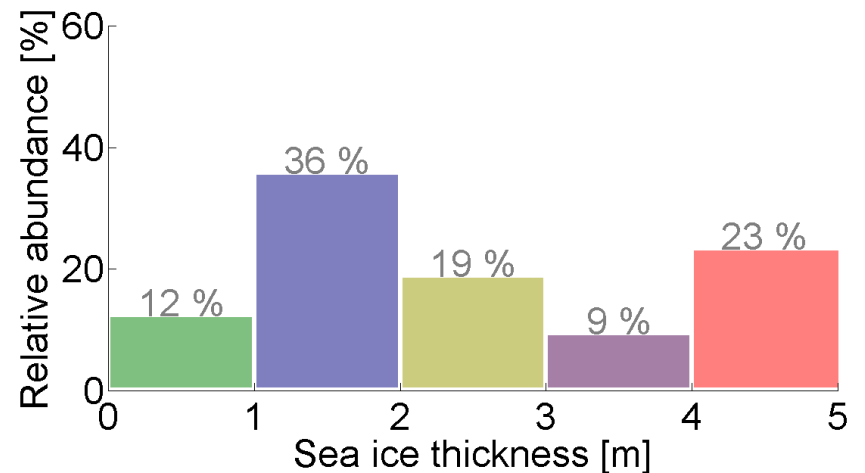
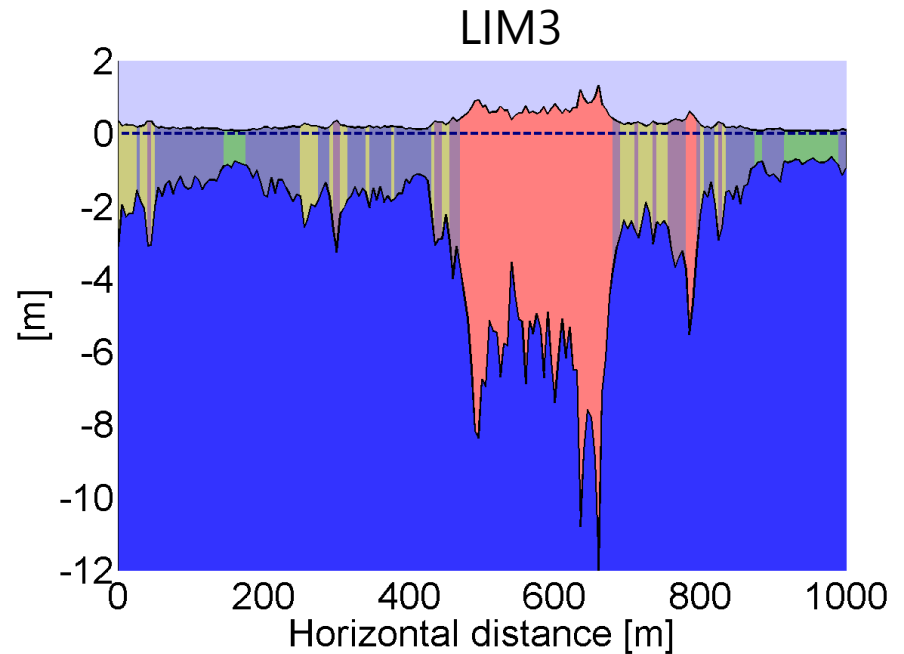
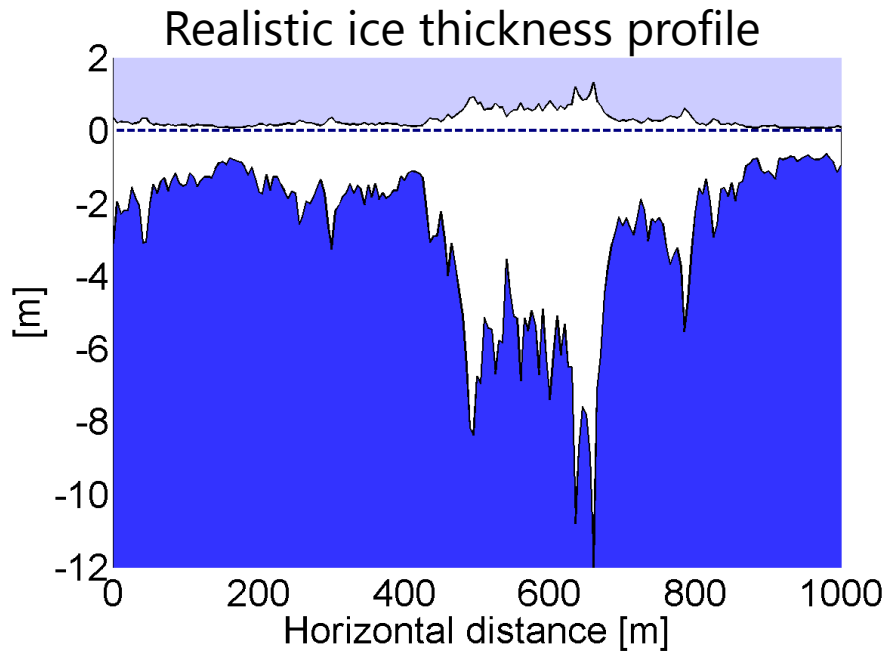
# How the LIM looked like yesterday



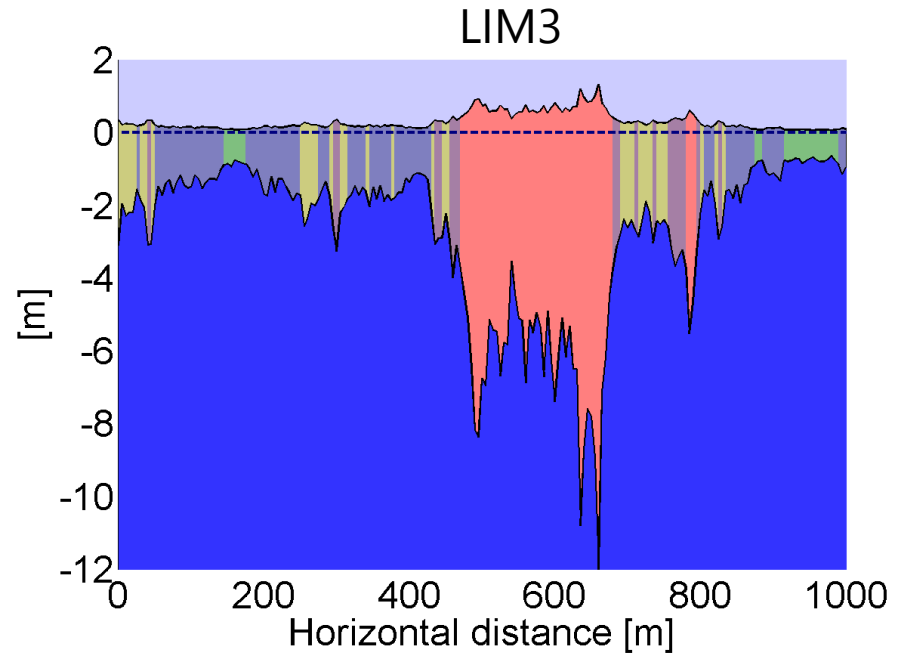
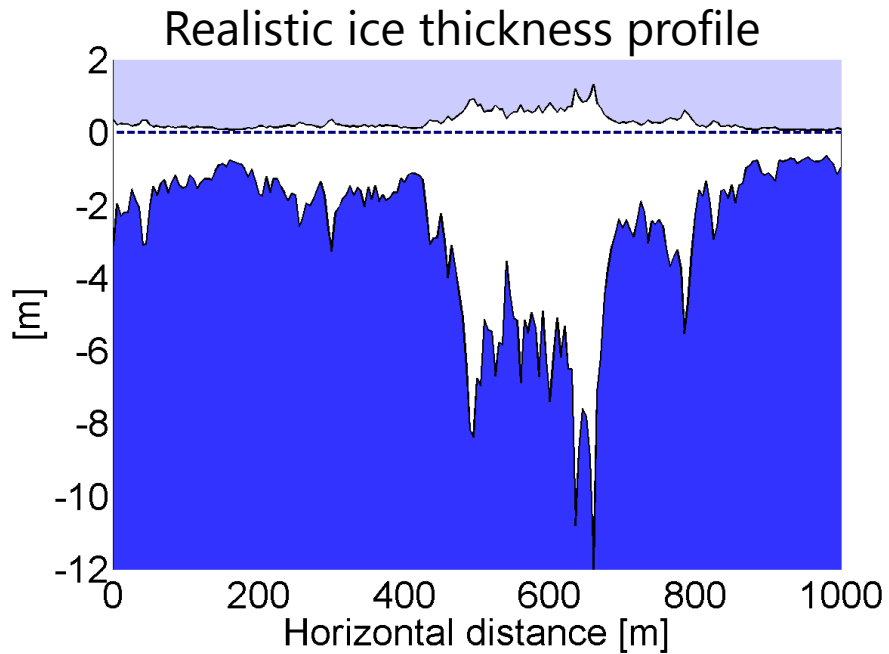
# How the LIM looks like today



# How the LIM looks like today

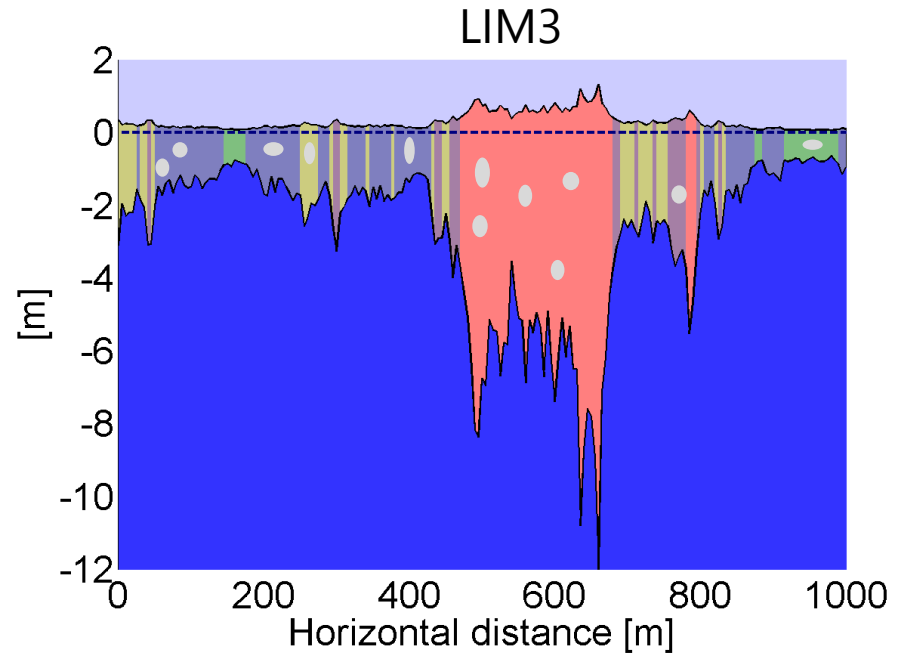
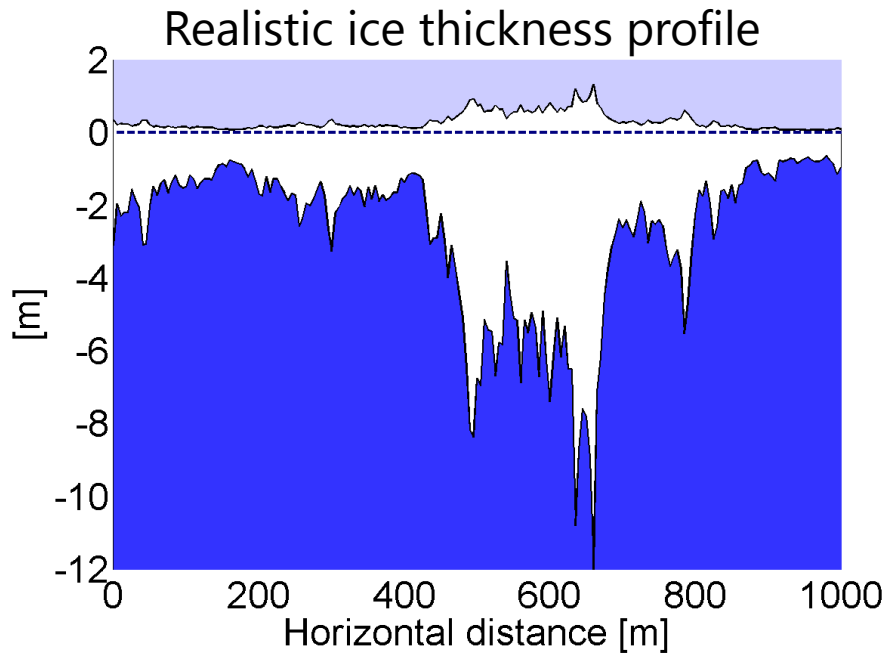


# How the LIM looks like today



LIM = LIM3  
= Ice thickness distribution

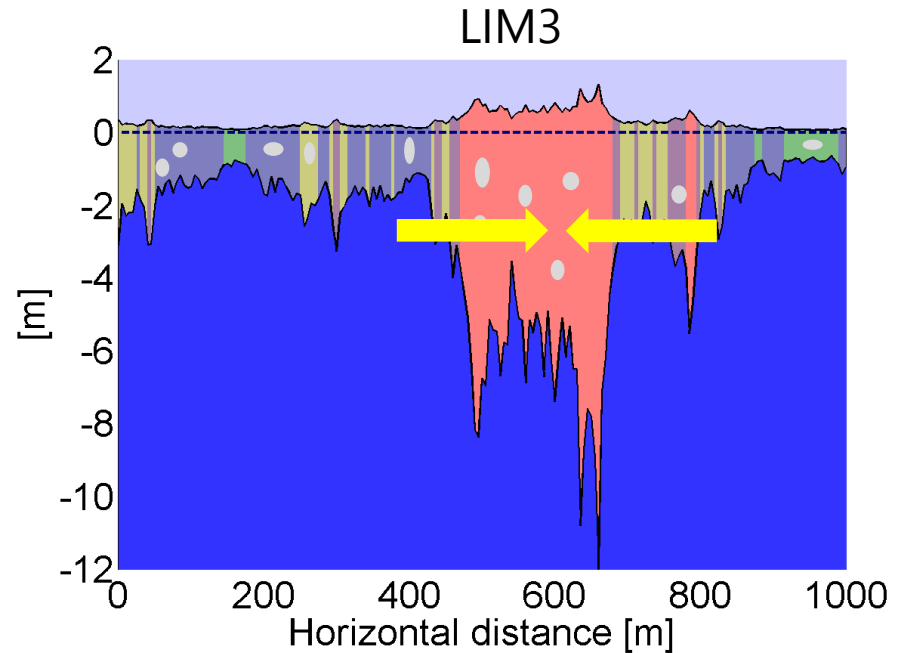
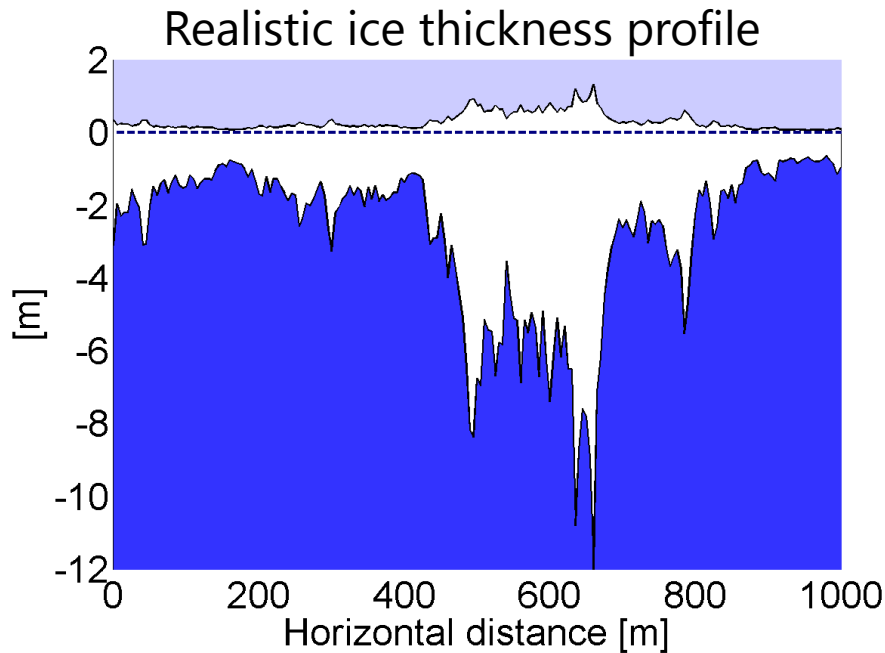
# How the LIM looks like today



LIM = LIM3  
= Ice thickness distribution +  
Salinity variations



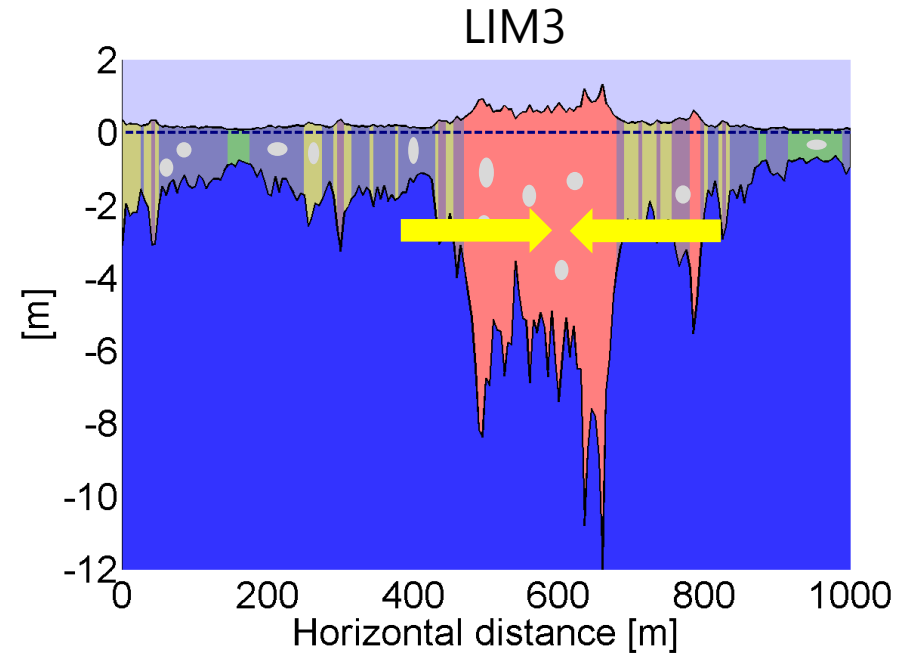
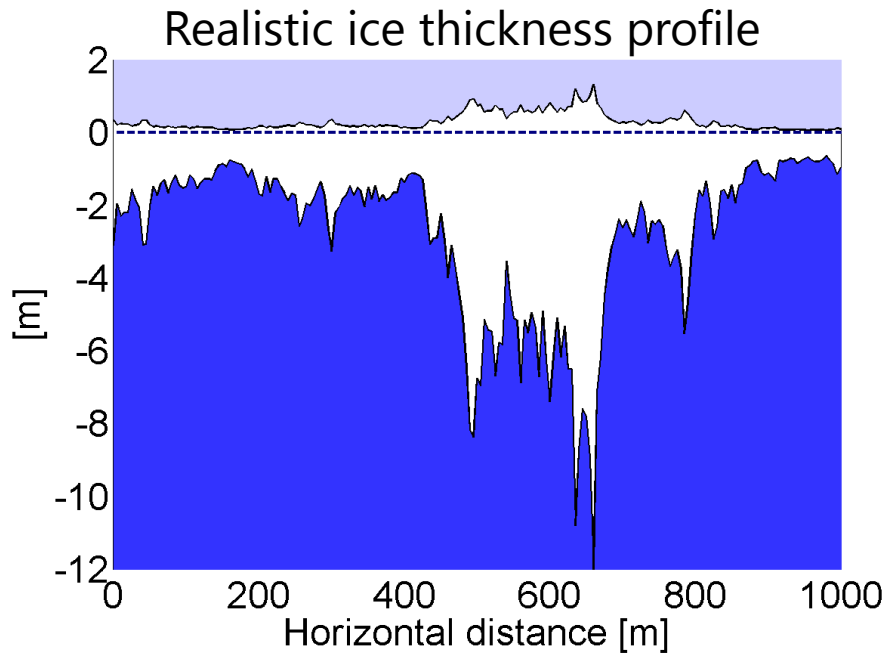
# How the LIM looks like today



LIM = LIM3

= Ice thickness distribution +  
Salinity variations +  
Elastic Viscous Plastic Rheology (C-Grid)

# How the LIM looks like today

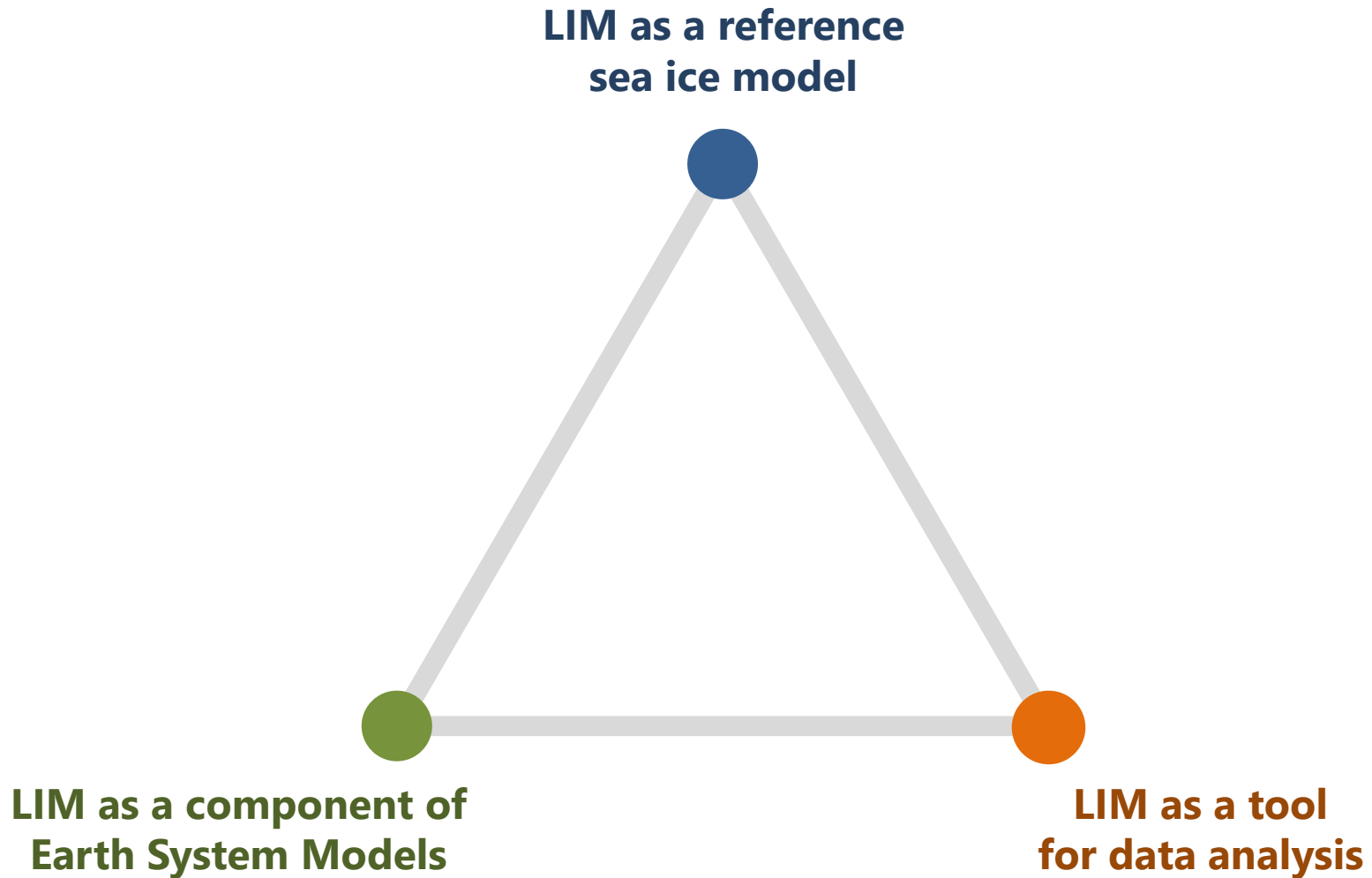


LIM = LIM3

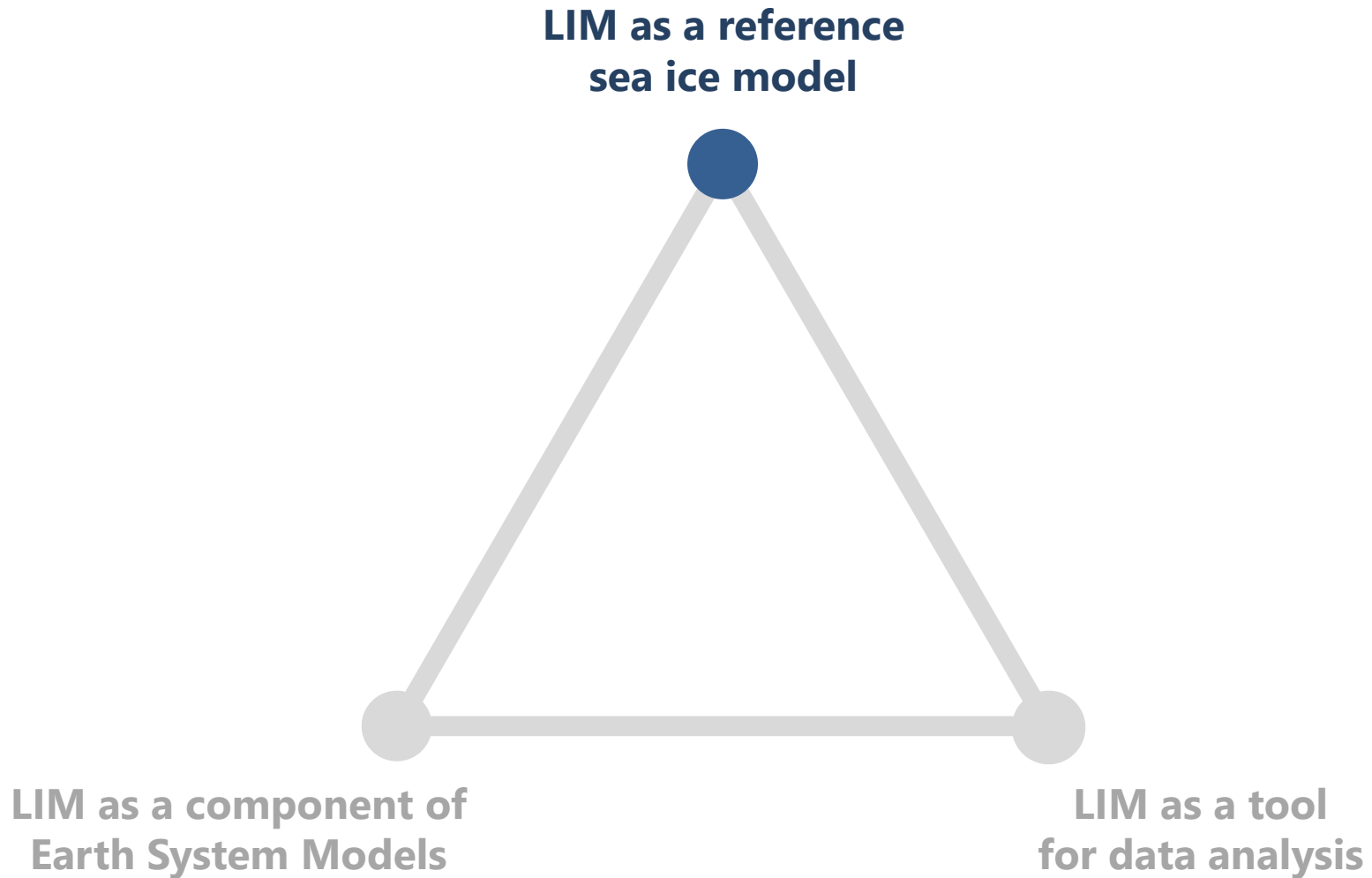
= Ice thickness distribution +  
Salinity variations +  
Elastic Viscous Plastic Rheology (C-Grid)

[www.climate.be/lim](http://www.climate.be/lim)

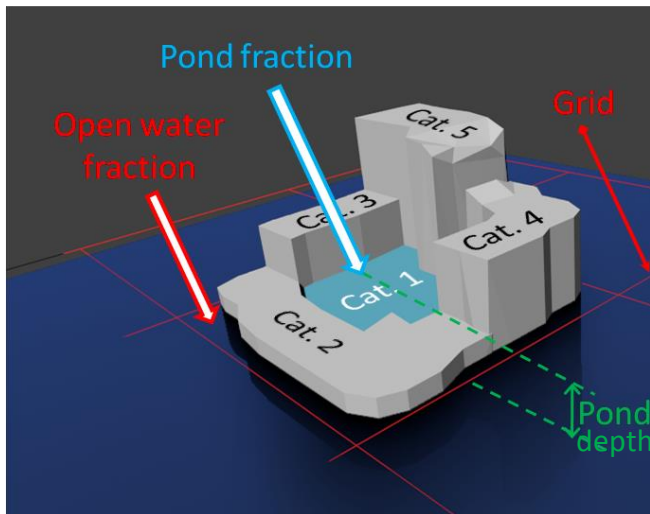
# Three directions for the Louvain-la-Neuve sea ice model



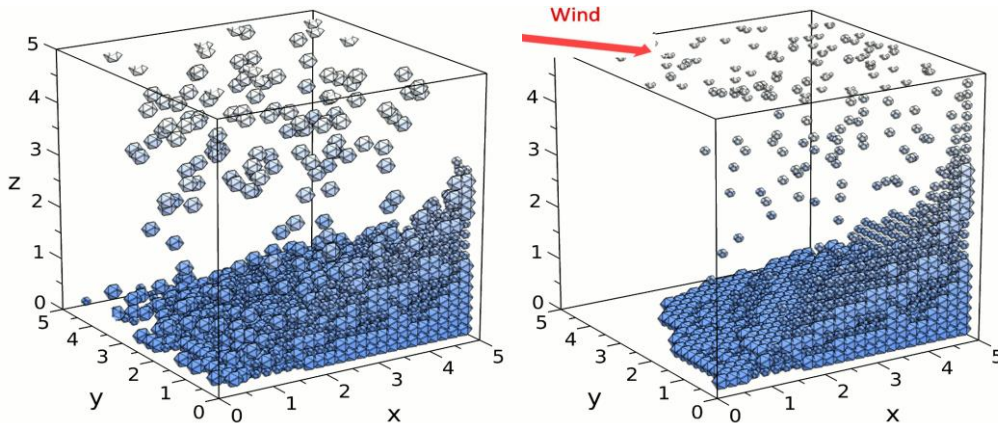
# Three directions for the Louvain-la-Neuve sea ice model



# A comprehensive snow model on sea ice



Inclusion of detailed melt pond scheme [Flocco et al., JGR, 2007]



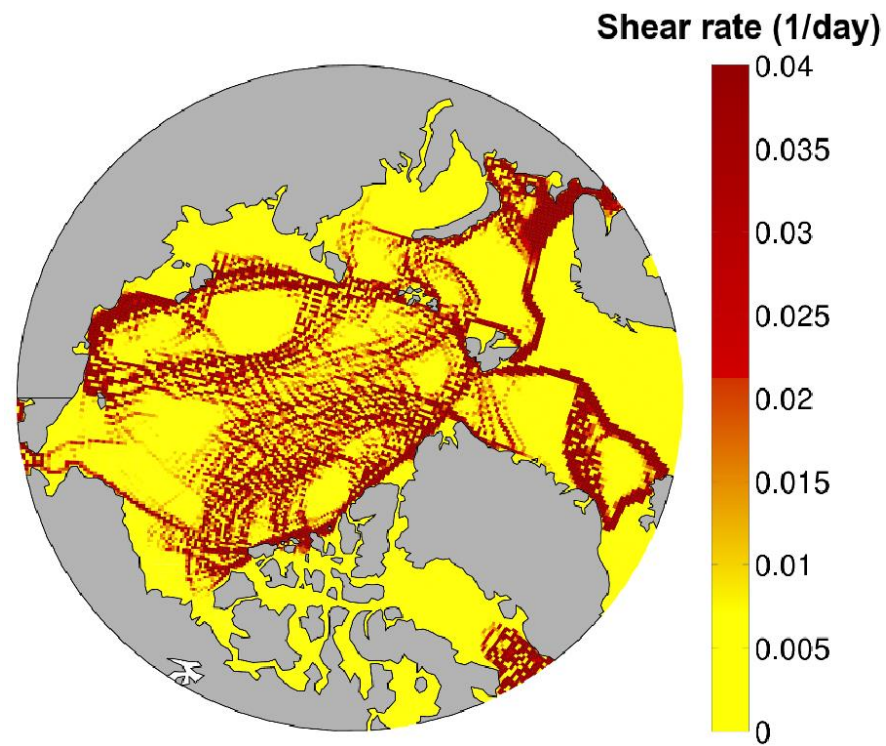
Modelling the effects of wind on snow density and redistribution

[Lecomte et al., 2013, JAMES]

[Lecomte et al., 2014, submitted.]

# A more realistic rheology for the sea ice pack

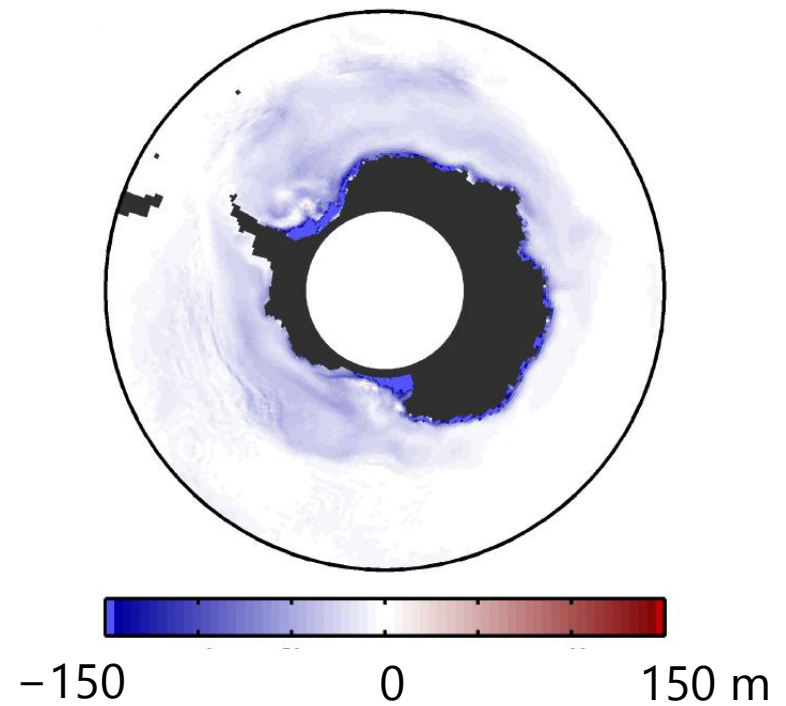
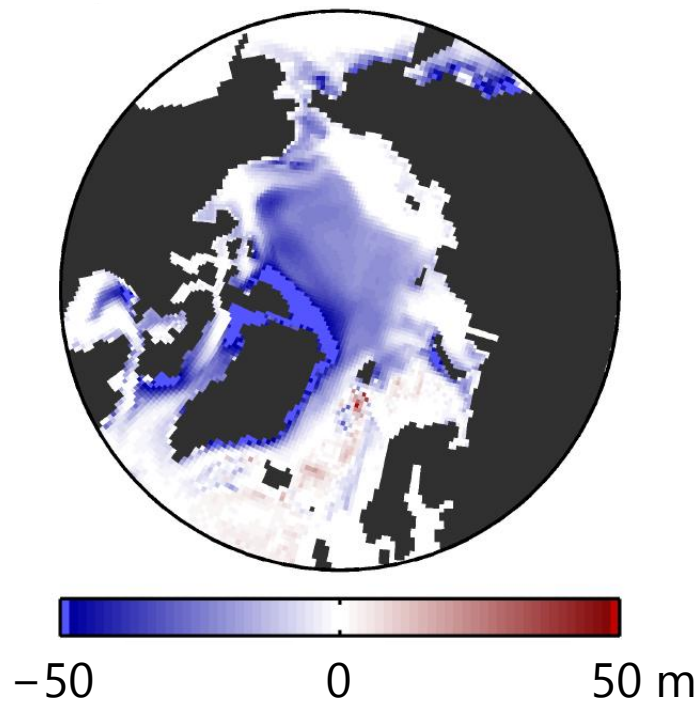
Elasto-brittle rheology in LIM



[J. Raulier PhD thesis, started Sept. 2013]

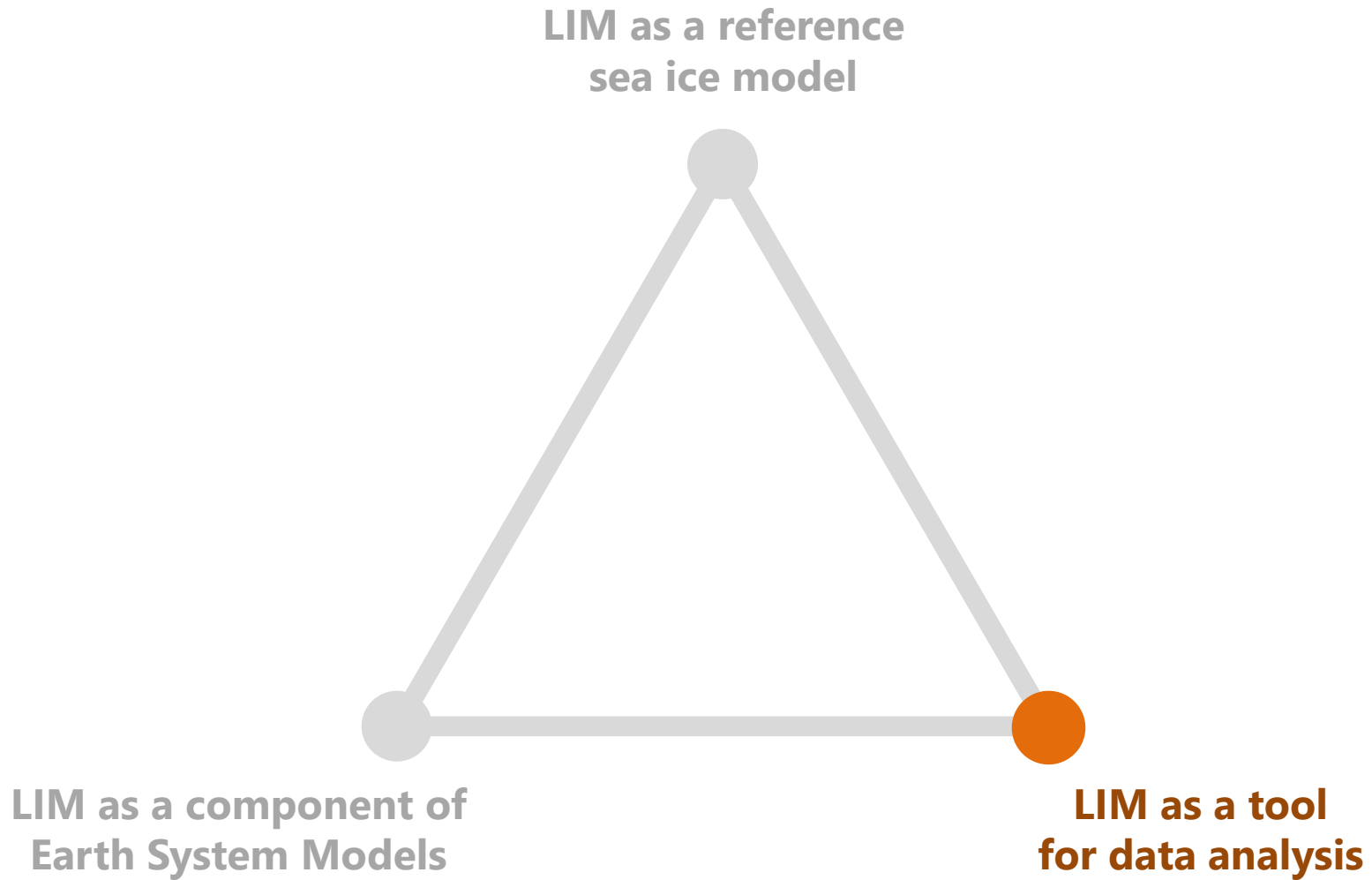
# Refining the ocean-sea ice interactions

Oceanic mixed-layer depth **change** after inclusion of brine rejection parameterization



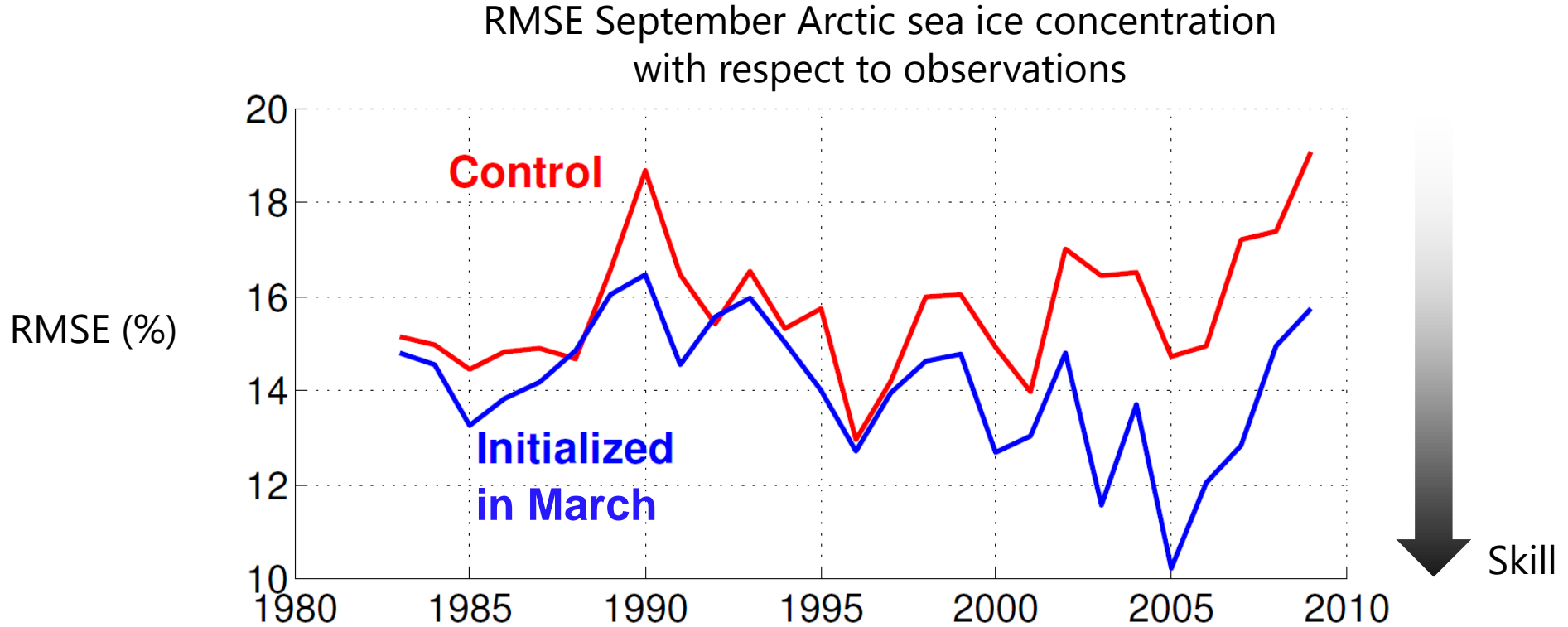
[Barthélemy et al., in preparation]

# Three directions for the Louvain-la-Neuve sea ice model

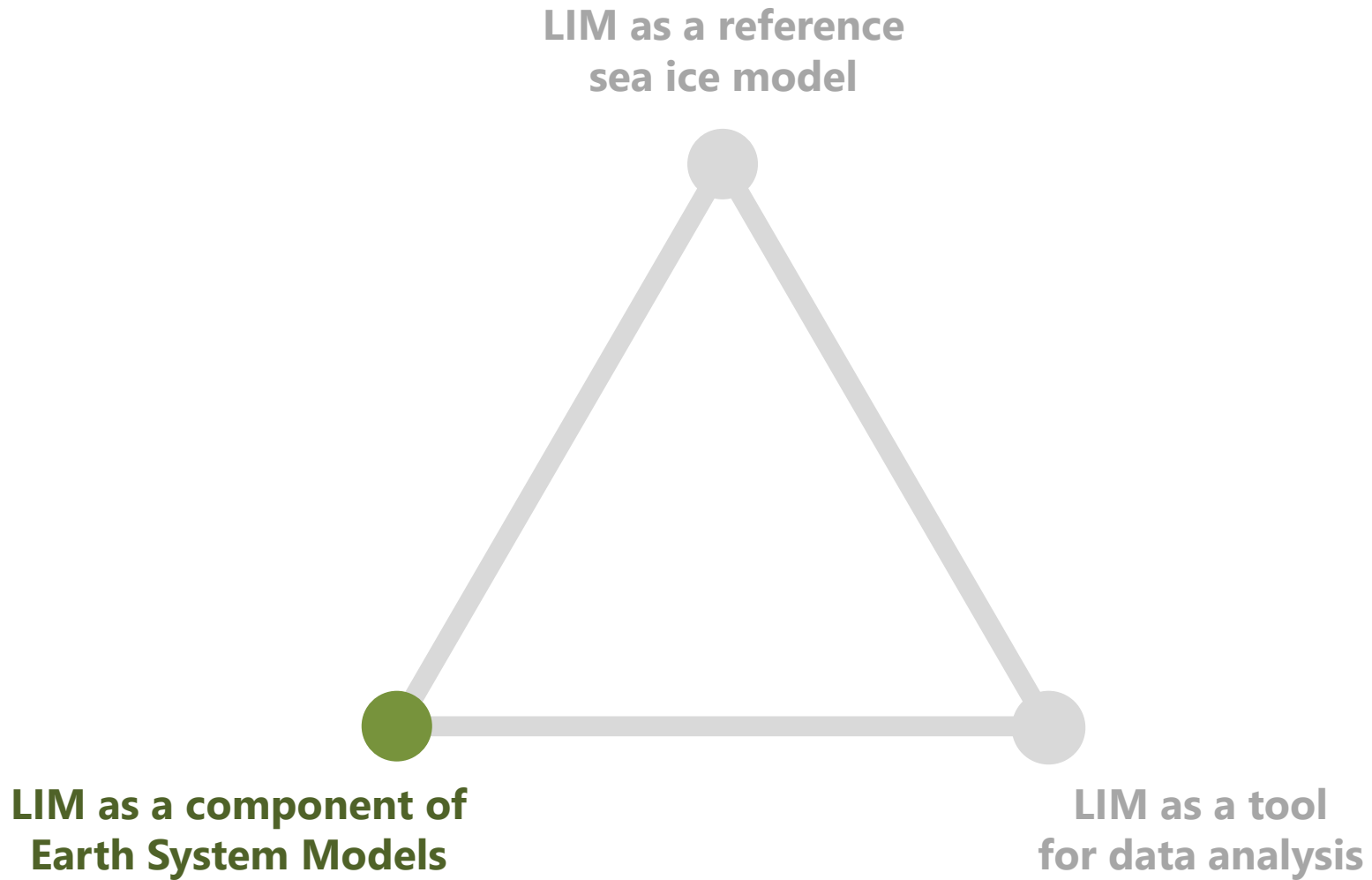




# Sea ice data assimilation for better seasonal-to-decadal predictions



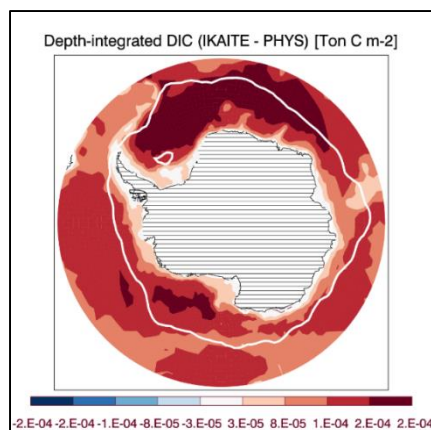
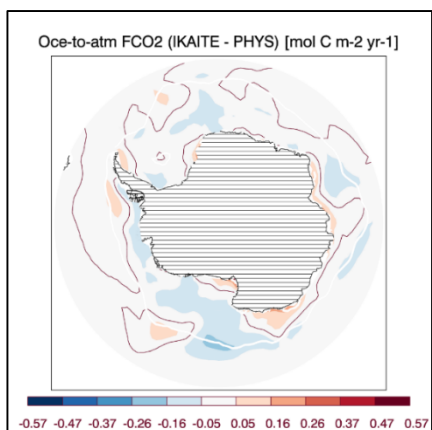
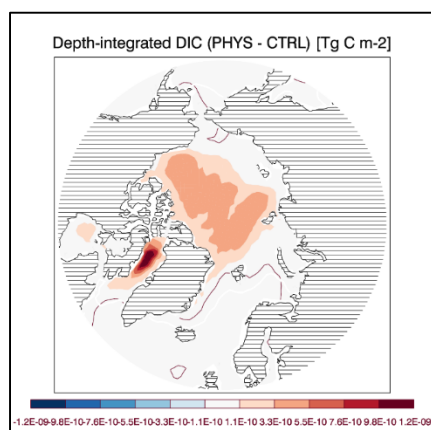
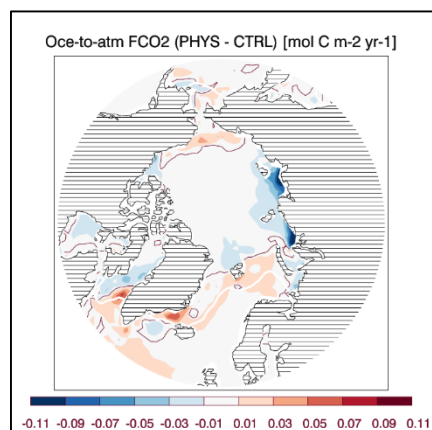
# Three directions for the Louvain-la-Neuve sea ice model



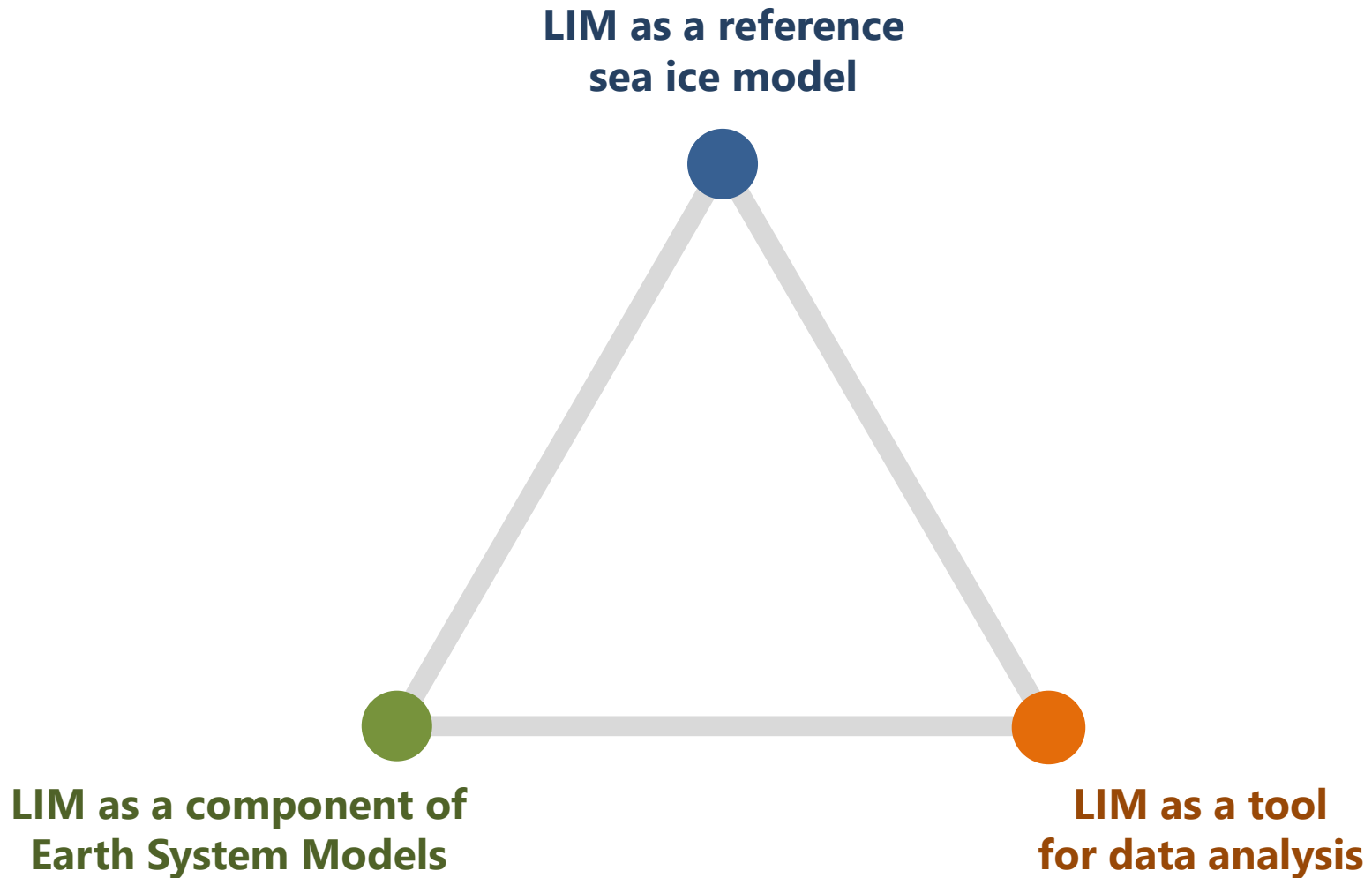
# Making sea ice an active player of biogeochemical cycles

Inclusion of carbon tracers (DIC and TA) in sea ice:

→ Significant modification of ocean-atmosphere  $\text{CO}_2$  fluxes and DIC export



# Three directions for the Louvain-la-Neuve sea ice model





# Thank you

[www.climate.be/lim](http://www.climate.be/lim)

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[www.climate.be/u/fmasson](http://www.climate.be/u/fmasson)



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