



Validation of the Sea-Ice Thickness simulated in an Coupled Ocean-Sea Ice Model

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INTRODUCTION

In recent several decades, we witnessed a dramatic decrease in both extent and thickness of Arctic sea ice ($>50^{\circ}\text{N}$) in response to atmospheric greenhouse gas (GHG) loading. The rapid decline, especially ice extent, has been reproduced by numerical models (e.g. Figure 1^[1]).

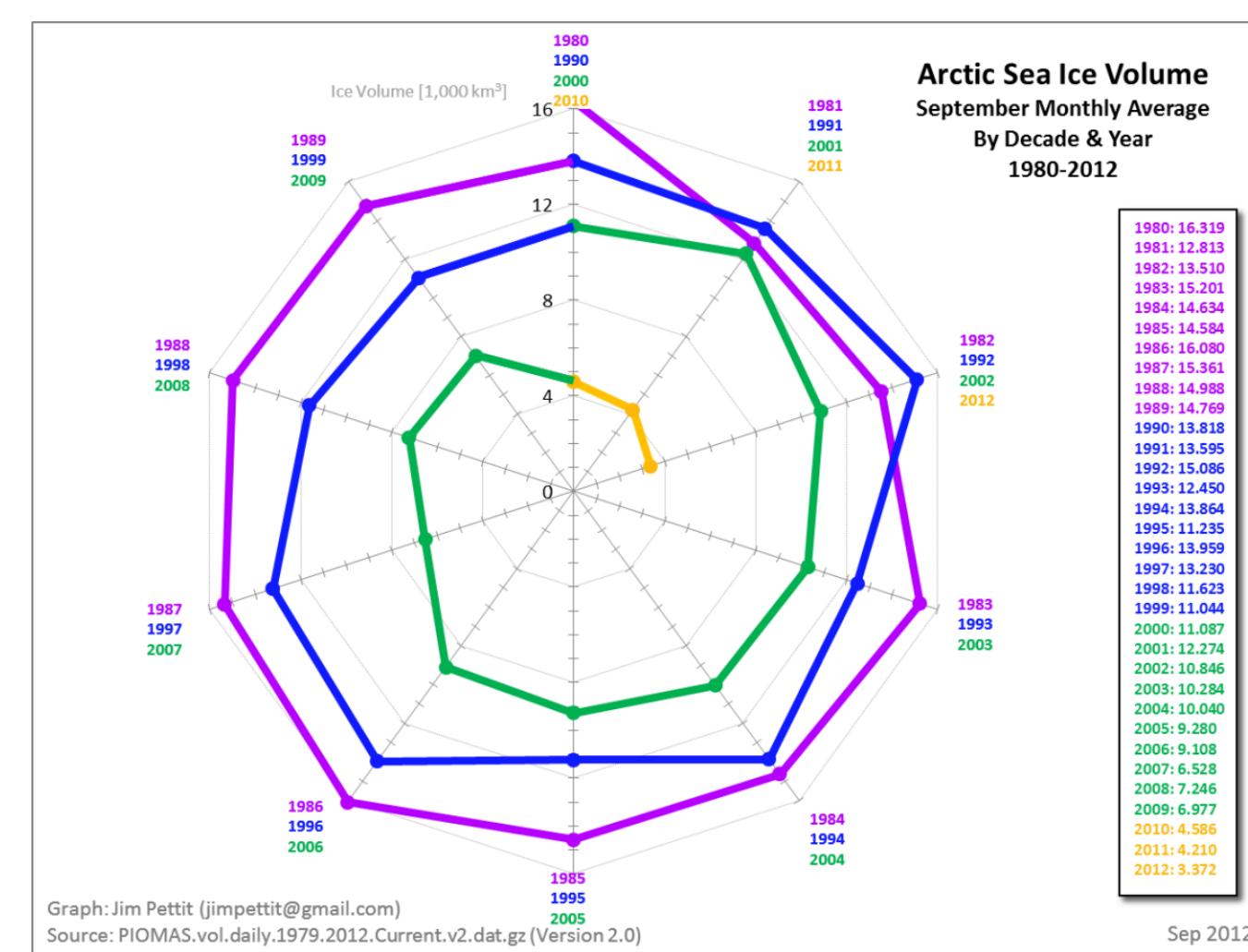
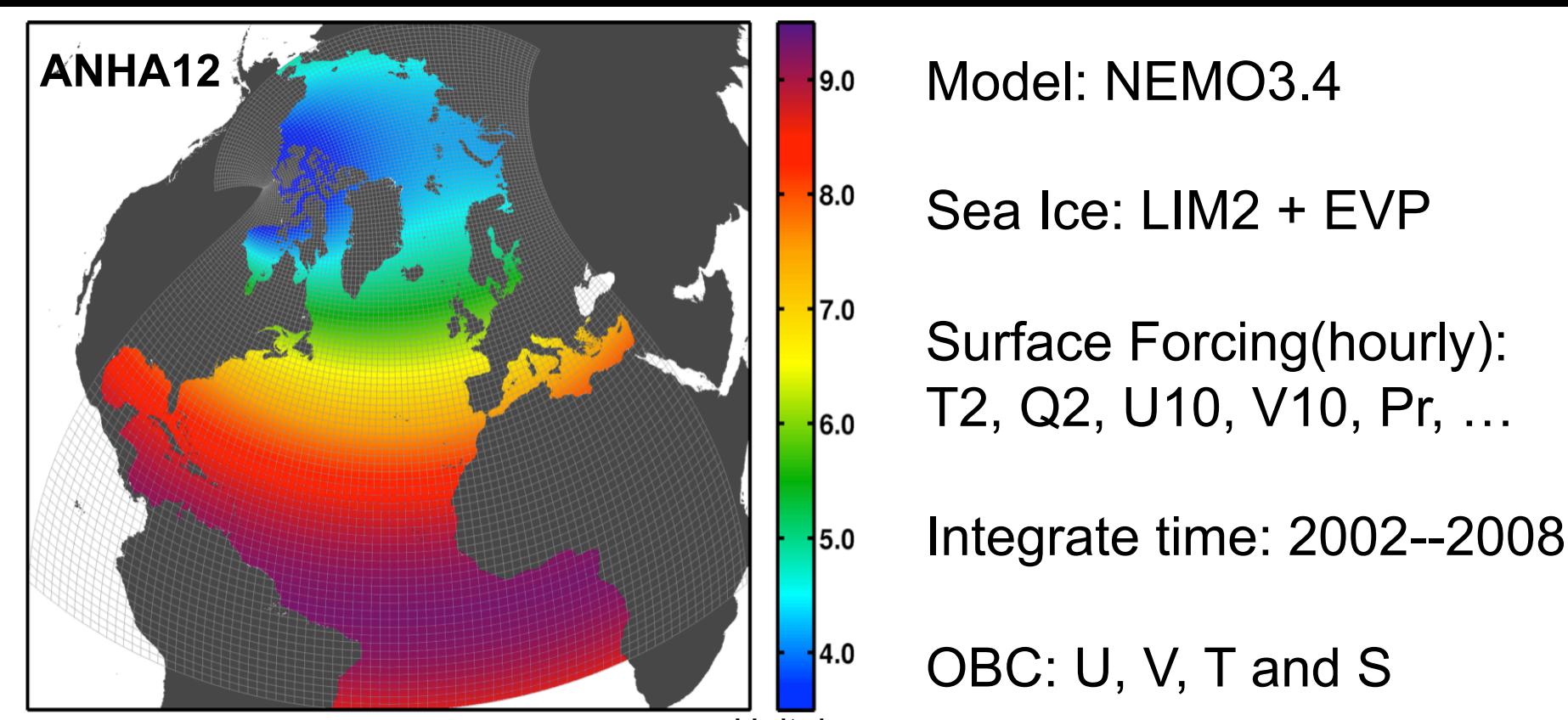


Figure 1. Arctic Sea Ice Volume Change 1980-2012

To validate and improve the accuracy and reliability of the model, it is crucial to compare with observations including sea-ice characteristic like ice thickness. The thickness estimates probability of sea ice survival over the melt season and its distribution appears to be undergoing rapid changes. The focus of this research is to validate the model by comparison and finally help refine the model.

[1] Pettit Climate Graphs. <https://sites.google.com/site/pettitclimategraphs/pettit-climate-graphs>

MODEL DESCRIPTION



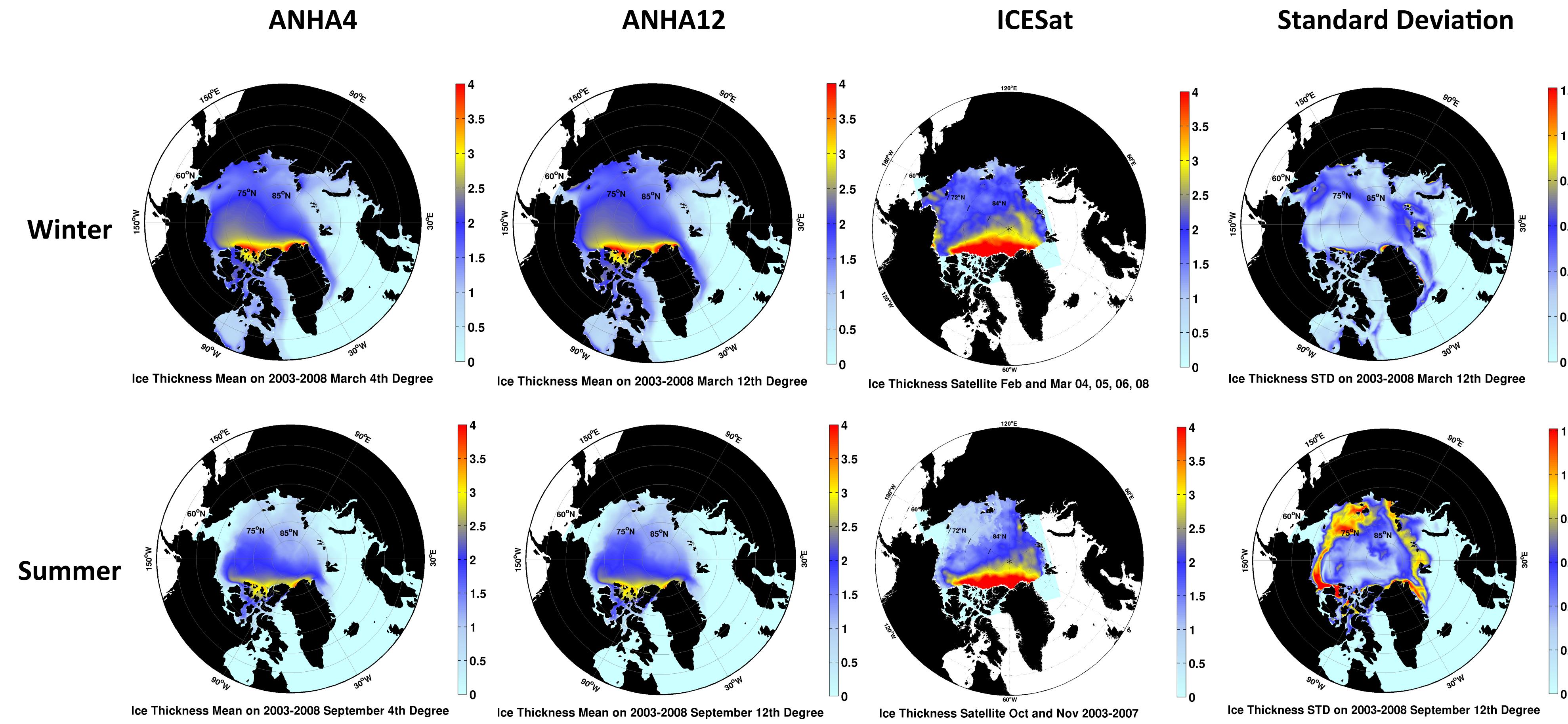
| | ANHA4 | ANHA12 |
|-----------------------|---|-------------|
| Domain | Arctic and Northern Hemisphere Atlantic | |
| Horizontal Resolution | 1/4 degree | 1/12 degree |
| Horizontal Mesh Grid | 544 x 800 | 1632 x 2400 |
| Vertical Levels | 50 | |

NEMO: Nucleus for European Modeling of Ocean

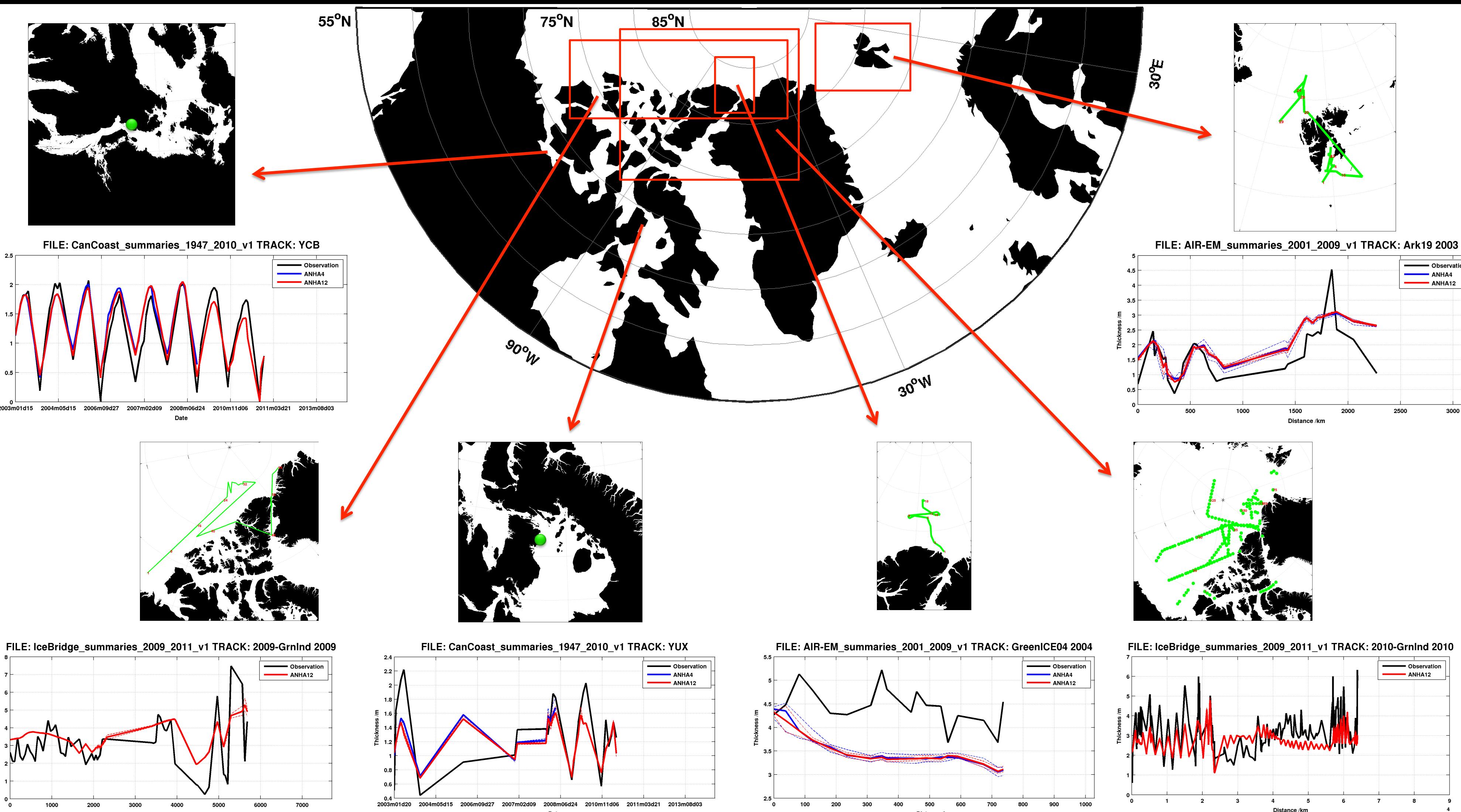
LIM: Louvain-La-Neuve Sea Ice Model
EVP: Elastic-Visco-Plastic

OBC: Open Boundary Condition

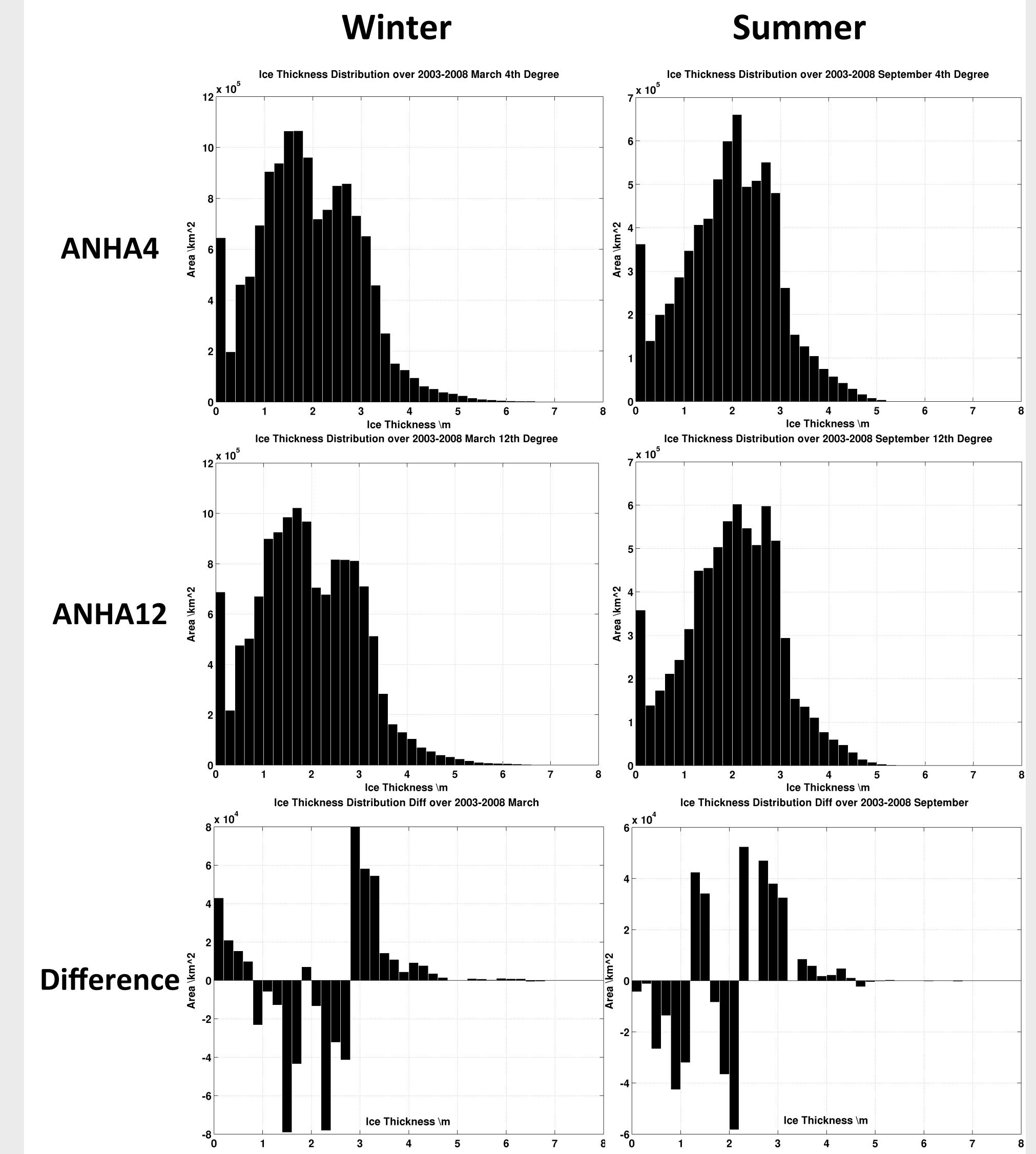
GENERAL ANALYSIS



OBSERVATION COMPARISON



THICKNESS DISTRIBUTION



SUMMARY & FURTHER STUDY

- Both ANHA4 and ANHA12 produce similar spatial pattern of the Arctic sea ice
- Larger ice thickness changes (STD) occur in the MIZ in summer
- Model results agree well with observations in the spatial or temporal variation at select locations.
- Overall, the ANHA12 produces more thick ice (~3m and above) and less thin ice (1-2m) within the area north of 50°N

Future work: We will study the thermodynamic and dynamic components of the thickness growth in the Arctic, especially at observation available locations, to better evaluate the model's capability in sea ice simulation.

ACKNOWLEDGE

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