

Theme #4

Surface Marine Heatwave Prediction Skill in the Canadian Seasonal to Inter-annual Prediction System (CanSIPS)

Introduction

Marine heatwaves (MHWs) present a growing threat to marine ecosystems in the context of climate change. Accurate representation of these events requires models to successfully capture not just the mean state of ocean temperature but also the tails of its temporal distribution. The rarity of the events also presents challenges for the evaluation of model skill. Here, we demonstrate skill of the Canadian global prediction system, CanSIPS, at MHW prediction. We also present comparisons with predictions based on the full North American Multi-Model Ensemble (NMME) as presented by Jacox et al. (2022).

CanSIPsv3

- Two coupled atmosphere-ocean-land models: GEM-NEMO and CanESM5.2
- 20 ensemble members per model
- Forcing, initialization, ensemble generation and online atmosphere/ocean bias correction described in Diro et al. (2024)

Methods

- Consistent with Jacox et al. (2022)
- Monthly average predictions and observations
- SST anomalies relative to lead-dependent climatology
- Trend removed over 1991-2020 analysis period
- 90th percentile SST estimated over centered 3-month window
- Same procedure applied to monthly averaged, regridded NOAA OISST
- Skill metric: Symmetric Extremal Dependence Index (SEDI)

Conclusions

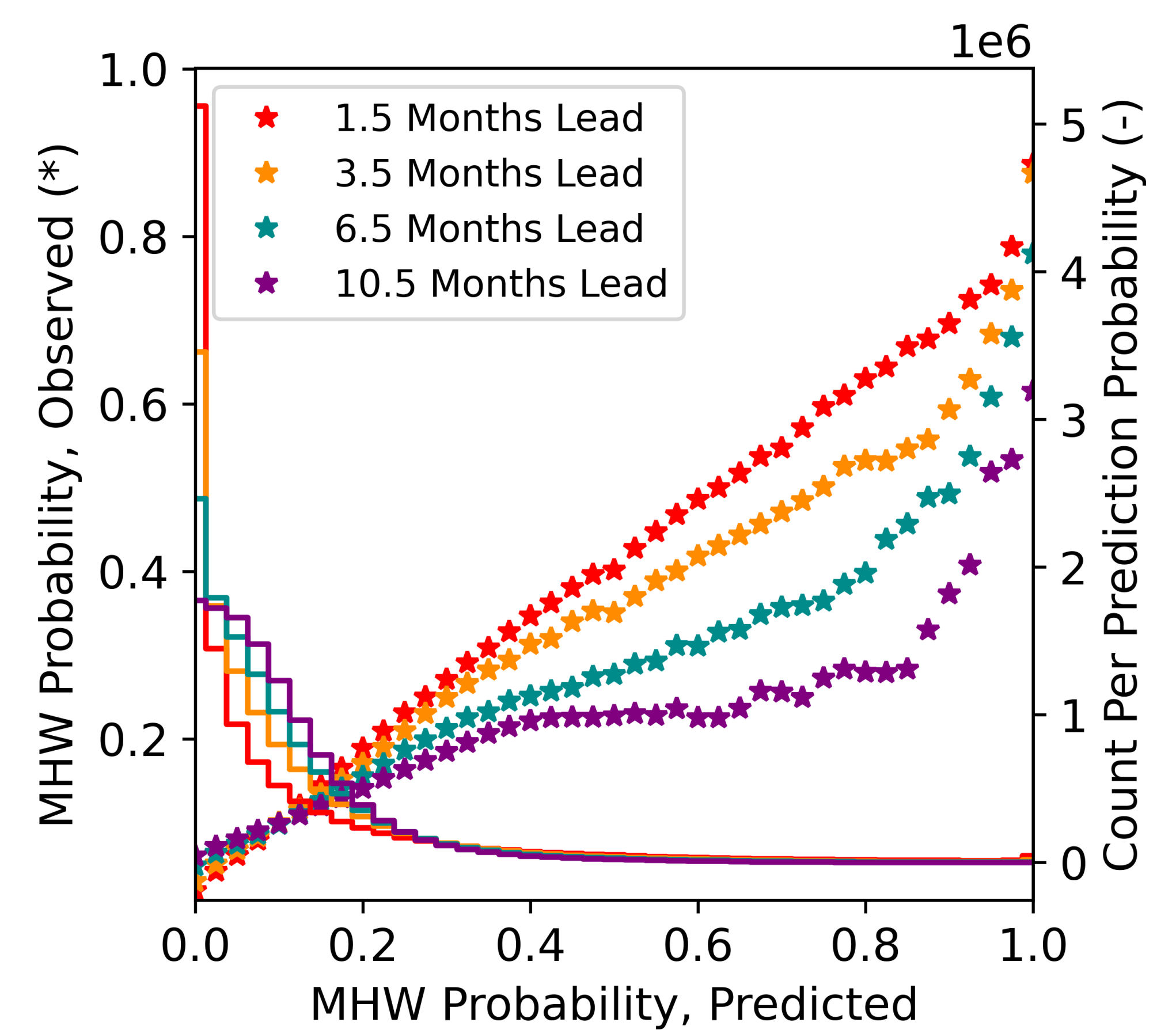
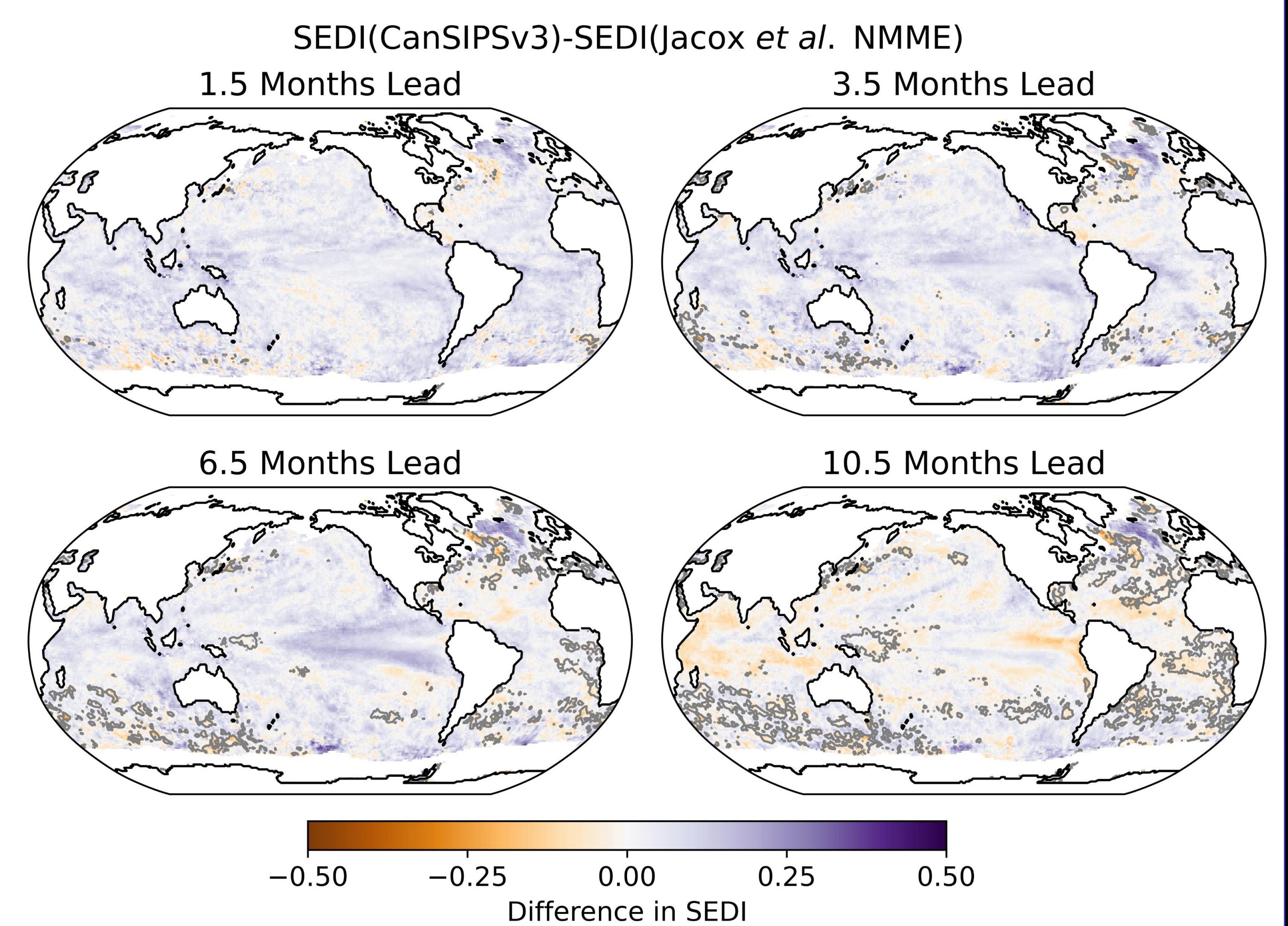
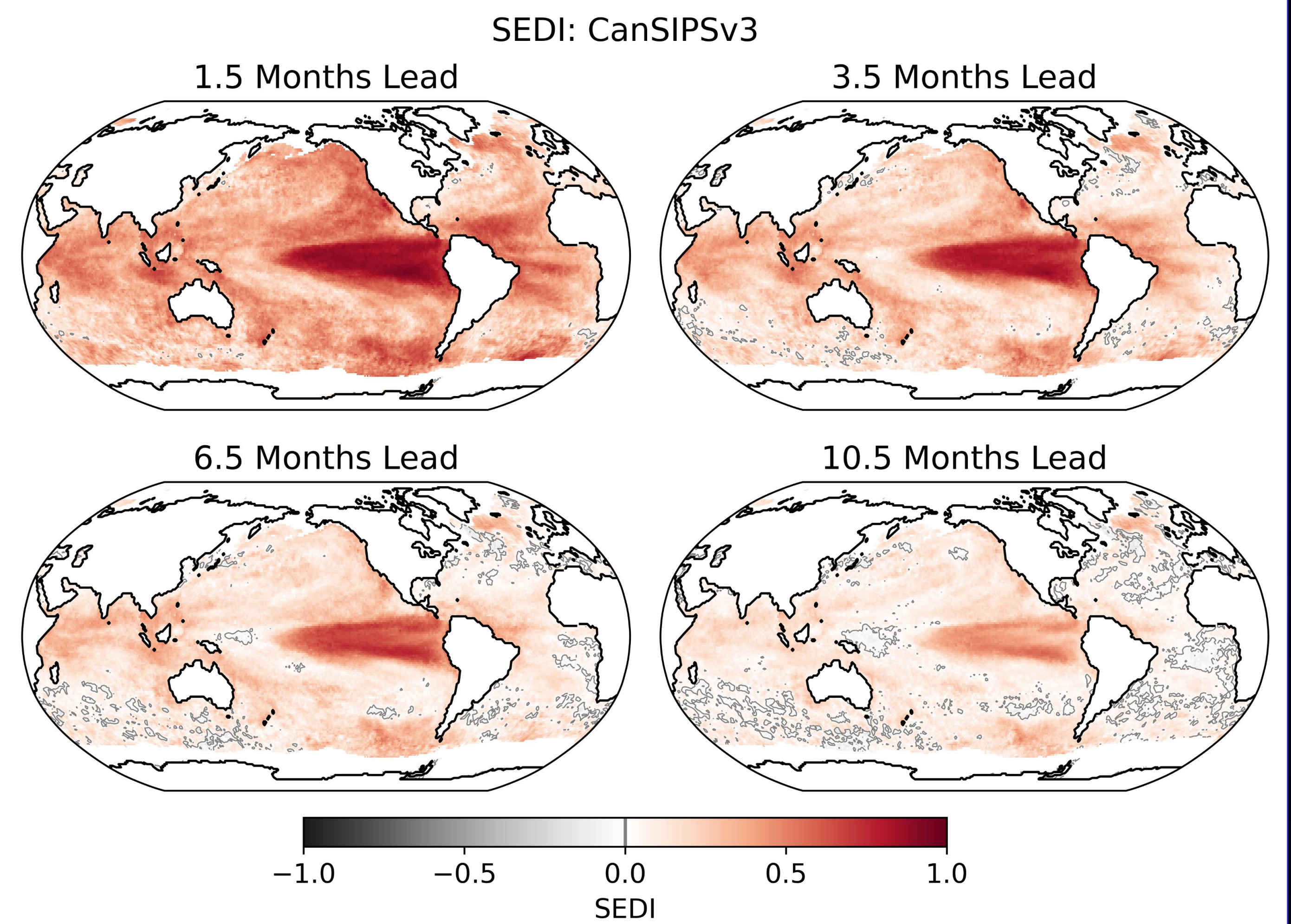
- Skill is highest in the ENSO-influenced Eastern Equatorial Pacific
- At many locations and lead times, the 2-model CanSIPS system shows greater MHW prediction skill (SEDI) than the Jacox et al. (2022) predictions based on the full NMME
- MHW skill in the Western Equatorial Pacific has increased relative to previous CanSIPS versions (not shown)

Next Steps

- Analyses at daily frequency
- Assessment of model skill at prediction of MHW intensity

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References

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- Jacox, M.G., Alexander, M.A., Amaya, D. et al. Global seasonal forecasts of marine heatwaves. *Nature* 604, 486–490 (2022).
<https://doi.org/10.1038/s41586-022-04573-9>