EGU General Assembly 2022

Synthetic tropical cyclone tracks for seasonal risk assessments

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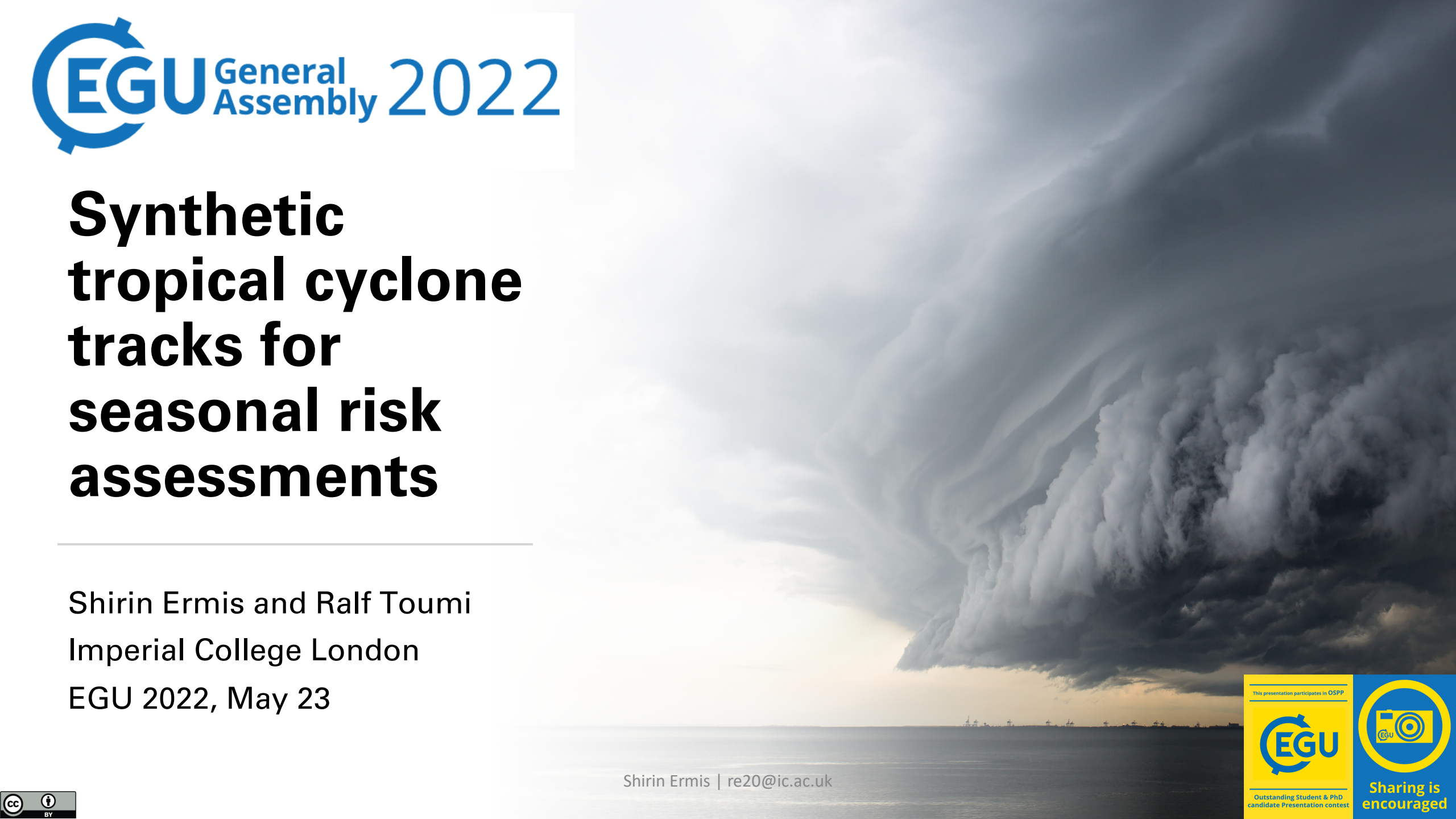

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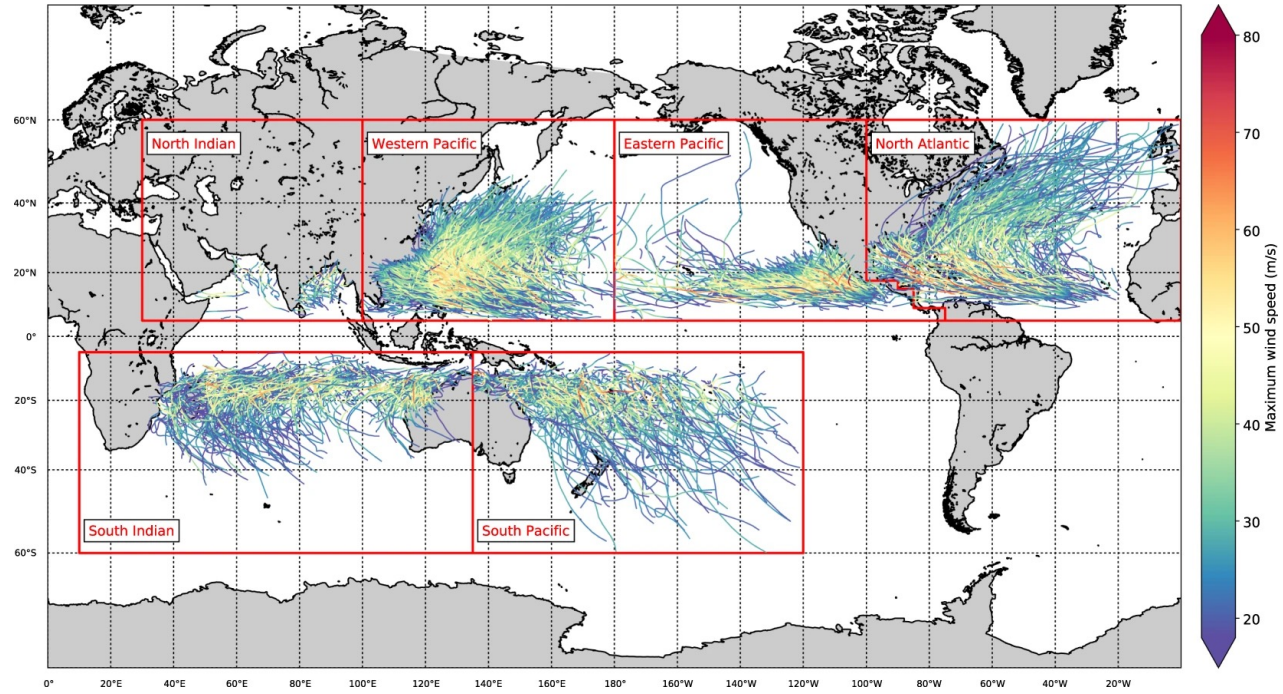
STORM – synthetic track model

- Developed by Bloemendaal et al. (2020) for risk assessments from tropical cyclones (TCs) in climate change scenarios
- Uses some empirical relationships for intensification
- Accurate landfall counts and intensities on basin level

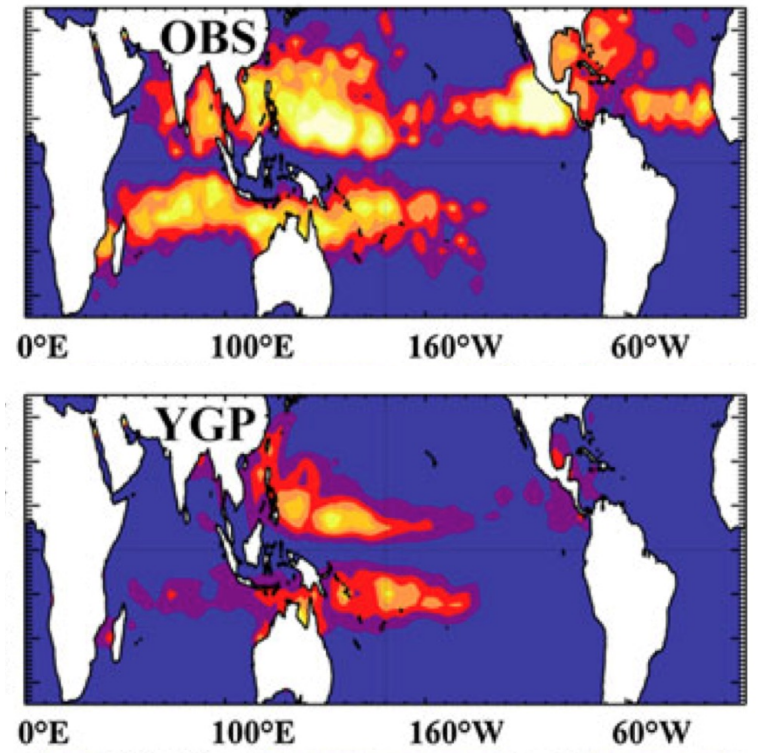


Bloemendaal et al. (2020)

Sub-basin challenges for seasonal risk assessments

1. Accurate Landfall counts on a sub-basin scale

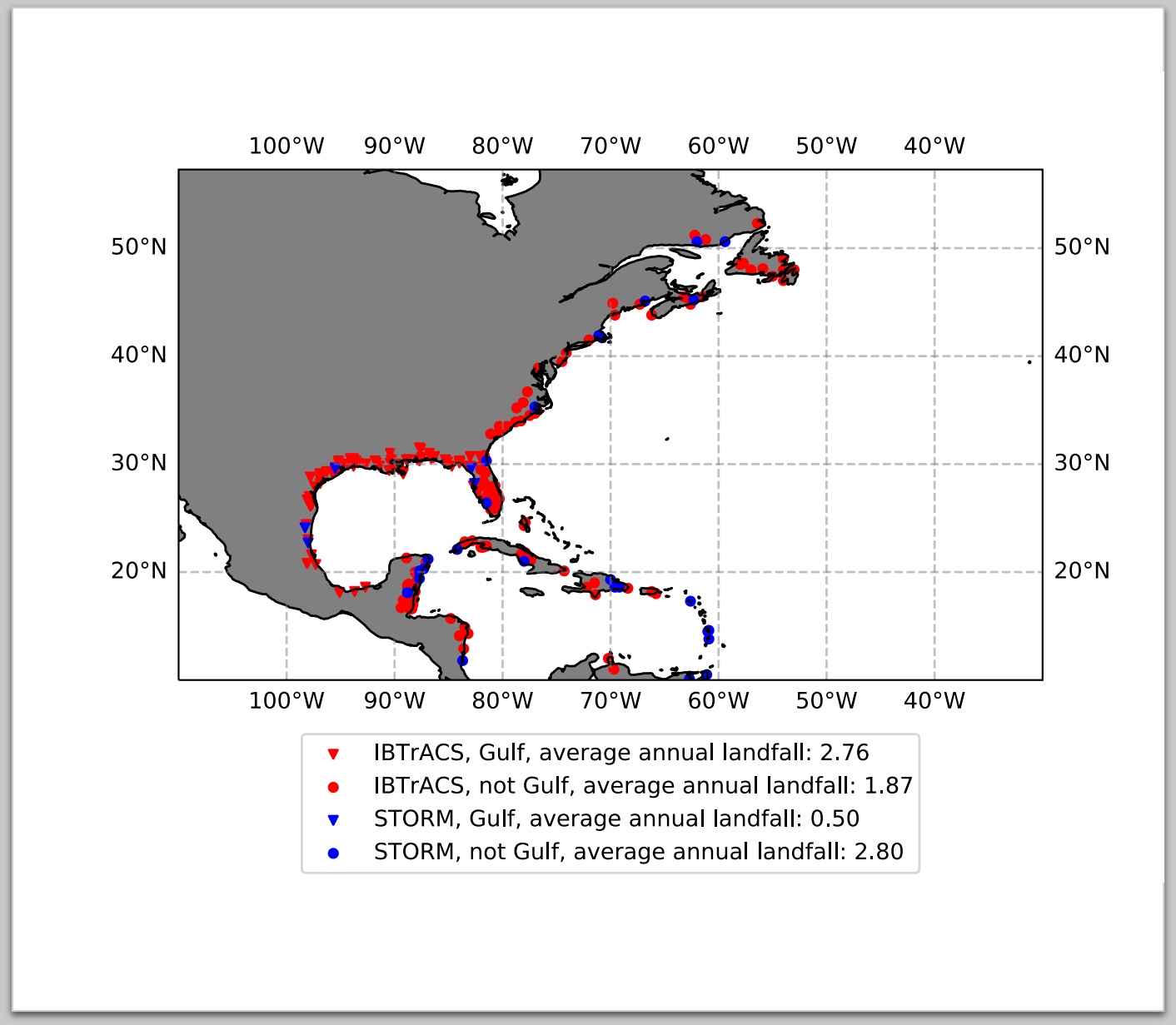
2. Interannual variability in TC activity



Menkes et al. (2012)

Annual landfall counts are inaccurate on regional scales

- Landfall counts are accurate on a basin level but not in smaller regions
- Track shapes can be strongly influenced by singular occurrences in areas where TC frequency is low (e.g. towards Europe)
- Gulf of Mexico is an extreme example: storms do not enter Gulf in model



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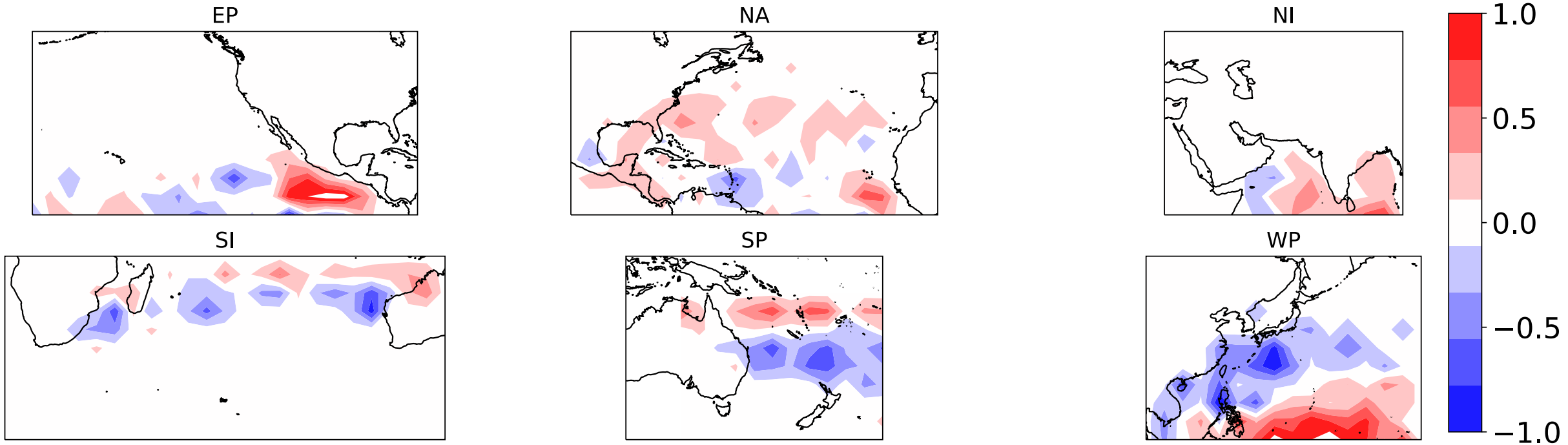
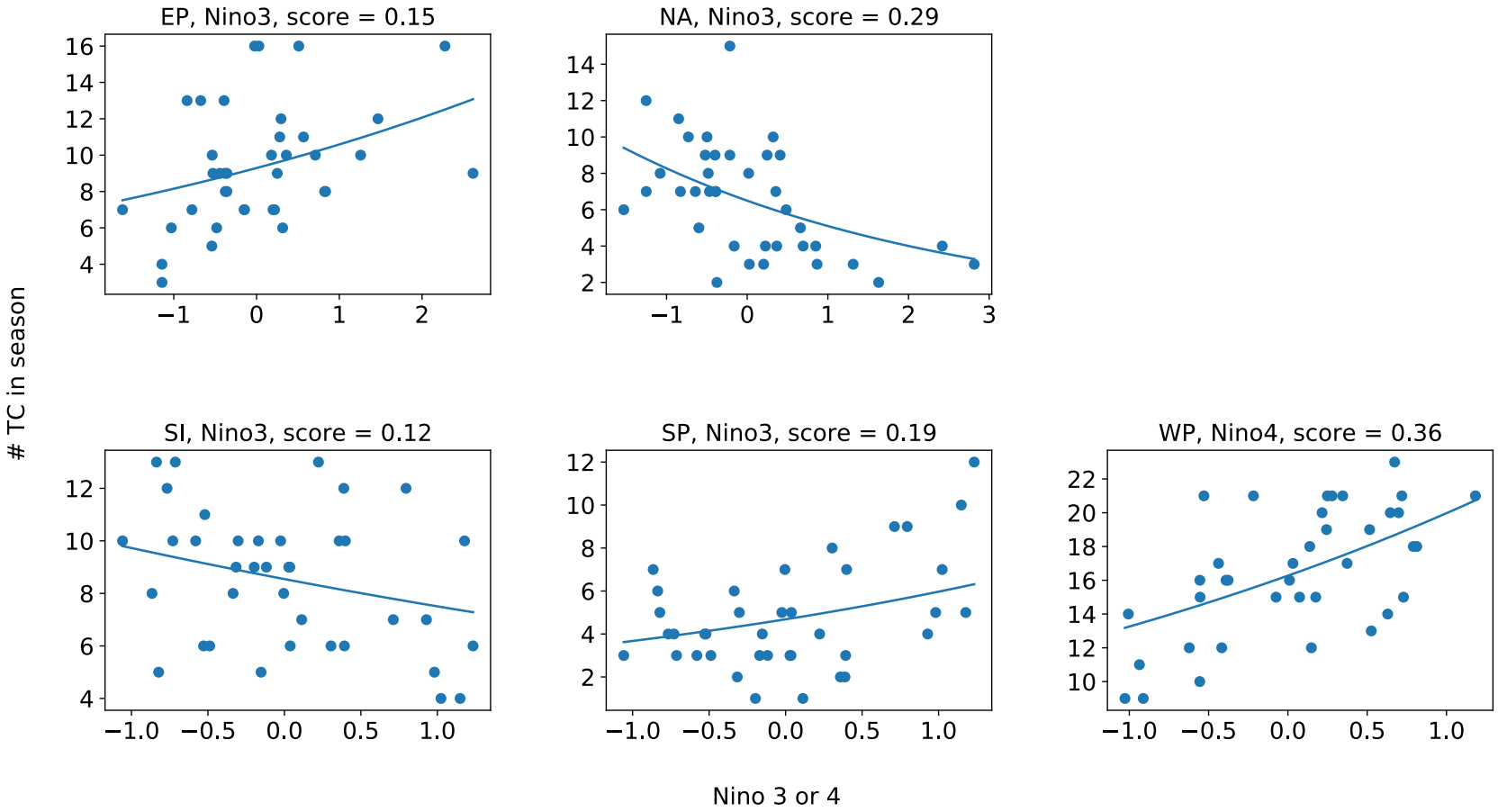
Standard deviation of annual genesis counts $\sigma_{\text{IBTrACS}} - \sigma_{\text{STORM}}$

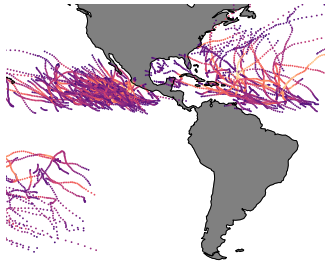


Poisson regression with ENSO

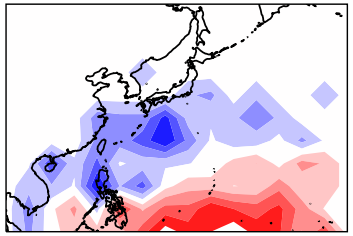
- Nino indices were averaged over the whole season for each basin instead of using monthly data
- Nino index for each basin chosen based on correlation
- No significant ($p<0.05$) for North Indian



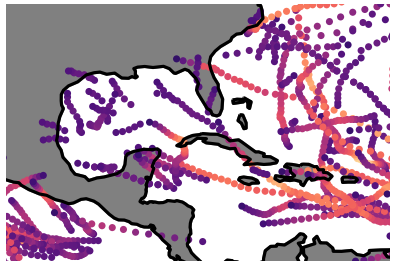
Outlook



Produce synthetic tracks using ENSO regression model



Analyse interannual variability – if necessary implement more complex genesis index



Reduce error sources in track shapes

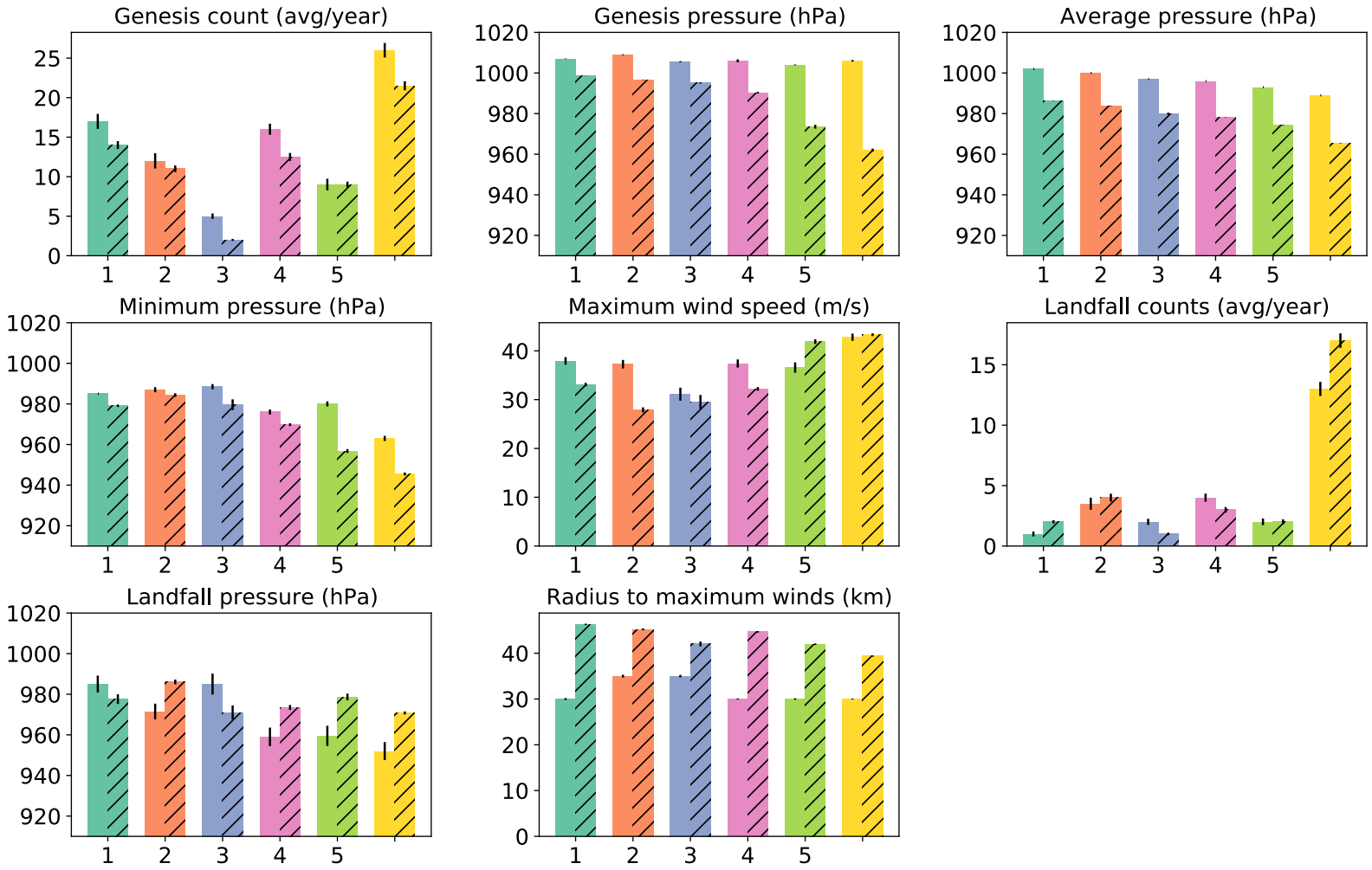
References

Bloemendaal, N., Haigh, I.D., de Moel, H., Muis, S., Haarsma, R.J. and Aerts, J.C., 2020. Generation of a global synthetic tropical cyclone hazard dataset using STORM. *Scientific Data*, *7*(1), pp.1-12.

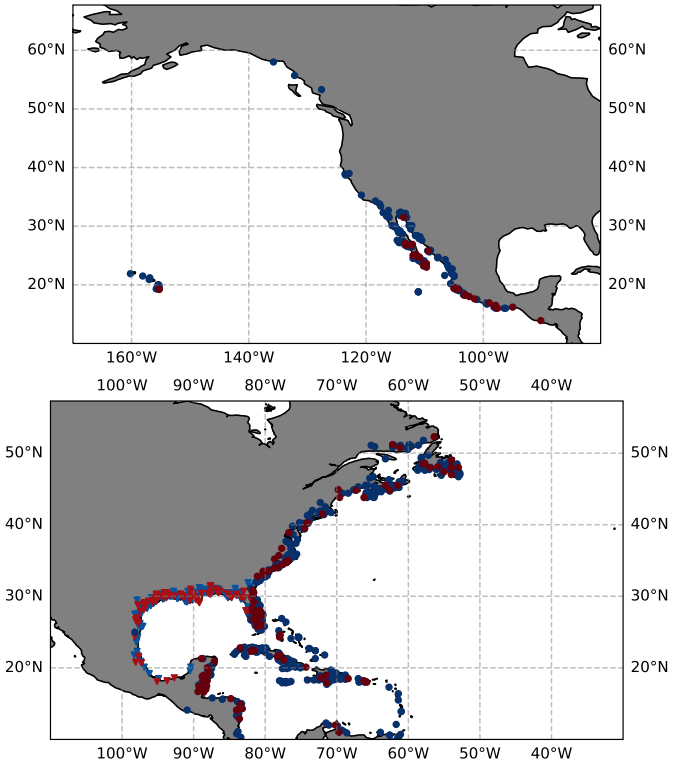
Bloemendaal, N., de Moel, H., Martinez, A.B., Muis, S., Haigh, I.D., van der Wiel, K., Haarsma, R.J., Ward, P.J., Roberts, M.J., Dullaart, J.C. and Aerts, J.C., 2022. A globally consistent local-scale assessment of future tropical cyclone risk. S*cience advances*, *8*(17) , p.eabm8438.

Menkes, C.E., Lengaigne, M., Marchesiello, P., Jourdain, N.C., Vincent, E.M., Lefèvre, J., Chauvin, F. and Royer, J.F., 2012. Comparison of tropical cyclogenesis indices on seasonal to interannual timescales. *Climate dynamics*, *38*(1), pp.301-321.

Appendix I

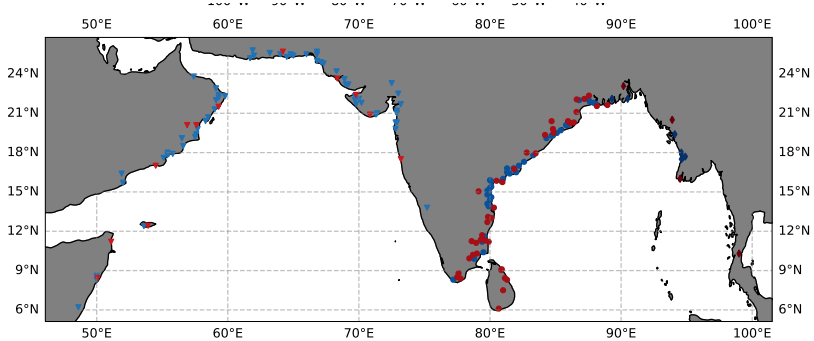

Genesis count (avg/year)
Genesis pressure (hPa)
Average pressure (hPa)
Minimum pressure (hPa)
Maximum wind speed (m/s)
Landfall counts (avg/year)
Landfall pressure (hPa)
Radius to maximum winds (km)

Appendix II

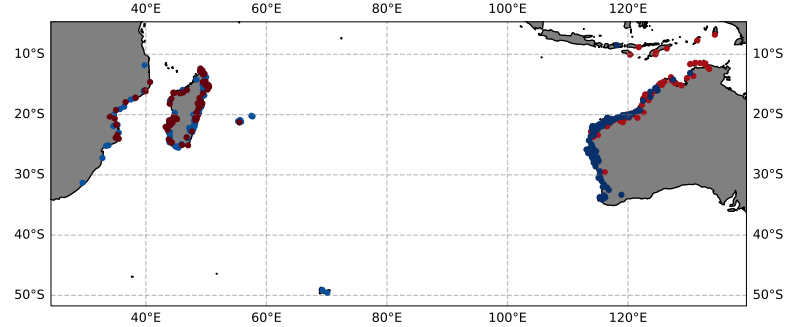


STORM, EP, MAL: 1.09
IBTrACS, EP, MAL: 0.84

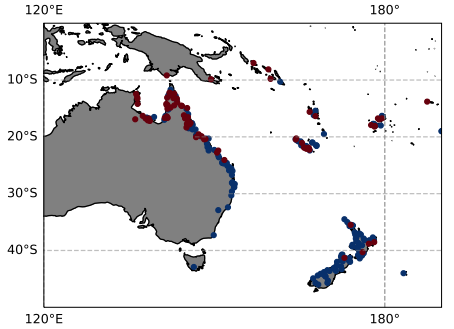
STORM, Gulf, MAL: 1.21
IBTrACS, Gulf, MAL: 2.58
STORM, not Gulf, MAL: 3.46
IBTrACS, not Gulf, MAL: 1.79



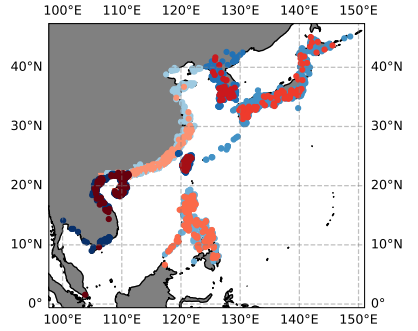
STORM, West India, MAL: 0.59
IBTrACS, West India, MAL: 0.32
STORM, East India, MAL: 0.40
IBTrACS, East India, MAL: 1.08
STORM, Bangladesh + Myanmar, MAL: 0.07
IBTrACS, Bangladesh + Myanmar, MAL: 0.11



STORM, Africa, MAL: 0.71
IBTrACS, Africa, MAL: 2.16
STORM, Australia, MAL: 0.99
IBTrACS, Australia, MAL: 1.82

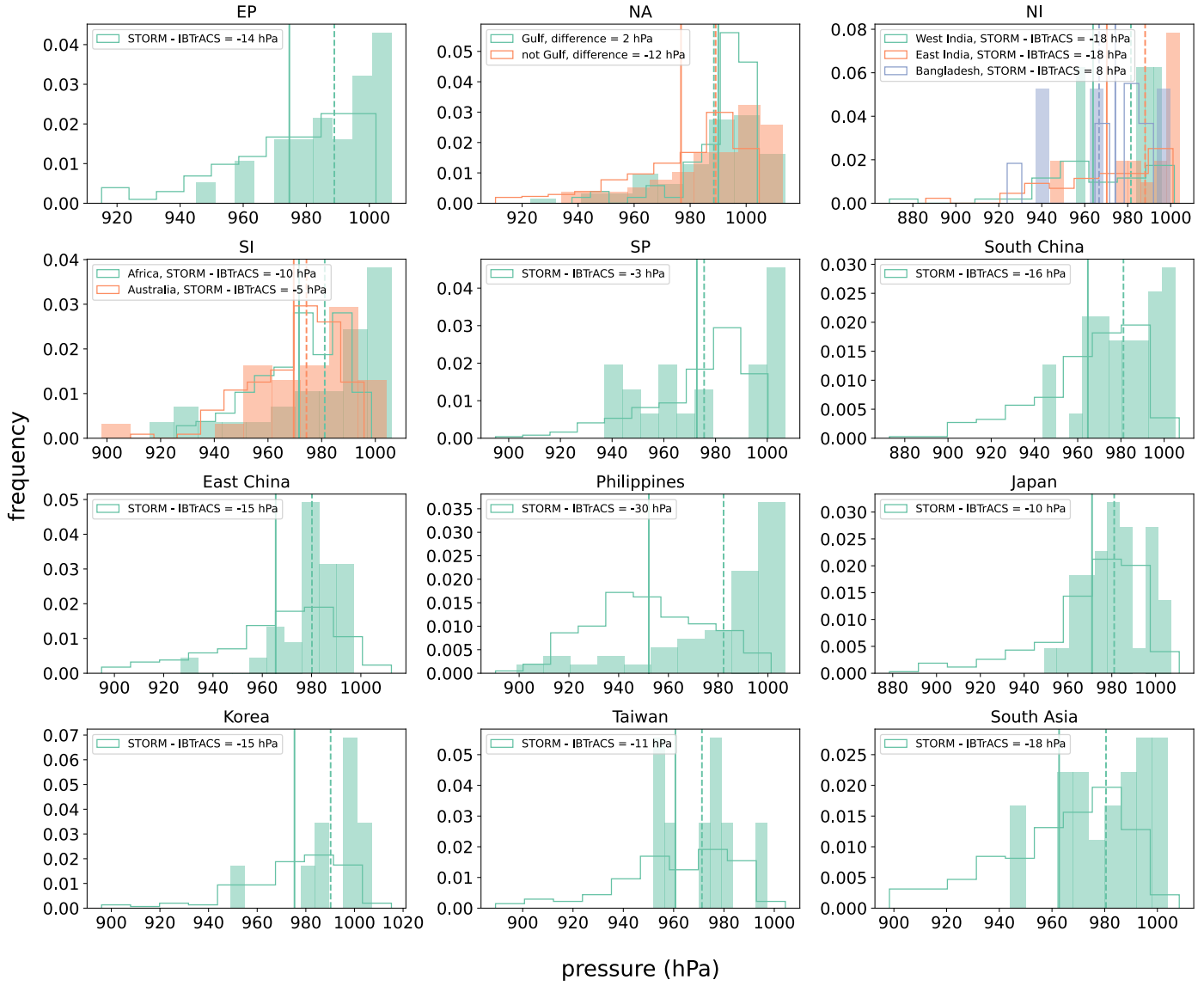


STORM, MAL: 1.55
IBTrACS, MAL: 2.05

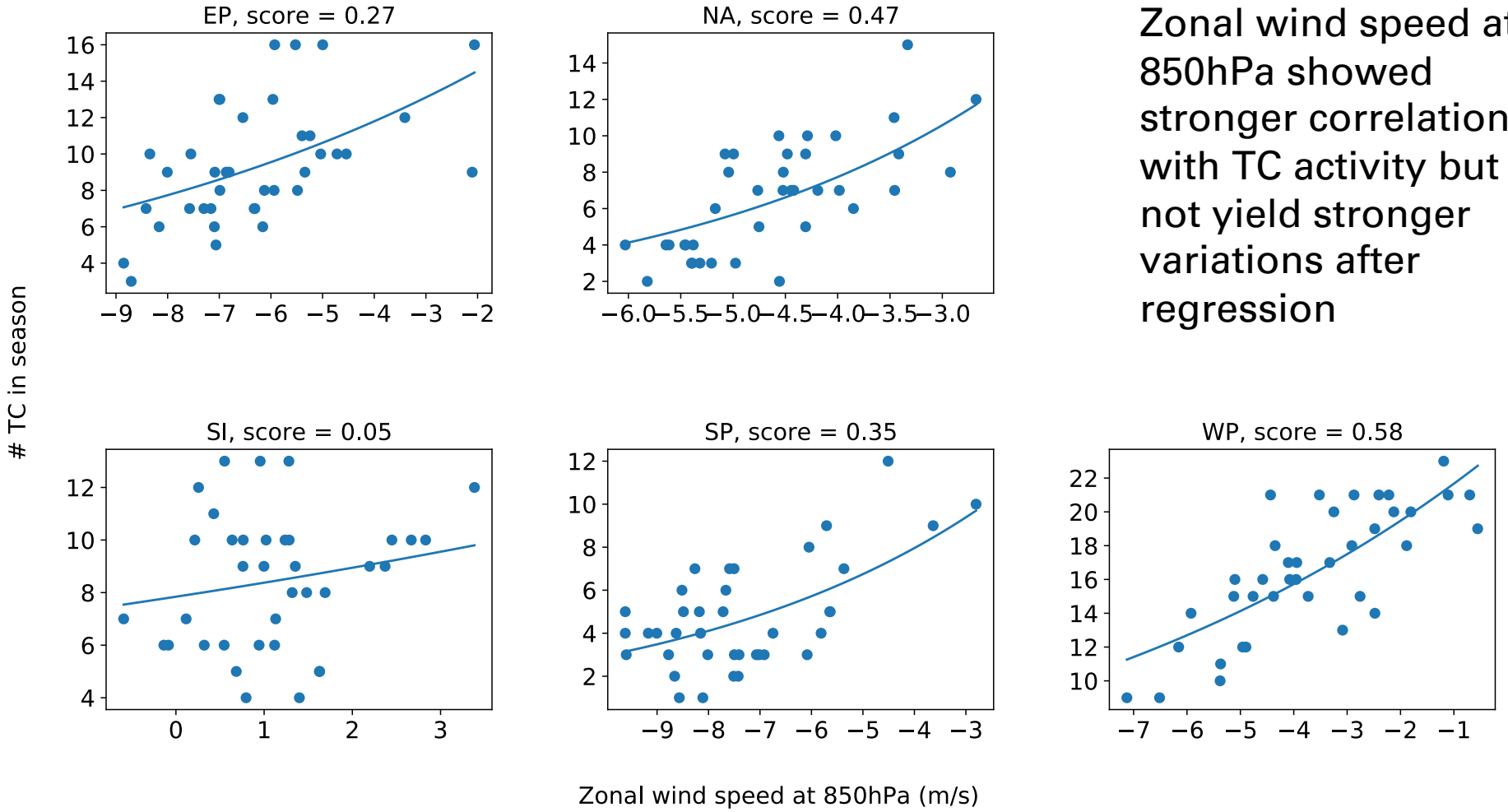


STORM East China, MAL 2.44
IBTrACS East China, MAL 1.79
STORM South China, MAL 3.15
IBTrACS South China, MAL 2.37
STORM, Philippines Asia, MAL 1.80
IBTrACS, Philippines, MAL 3.39
STORM, Japan, MAL 4.23
IBTrACS, Japan, MAL 2.79
STORM, Korea, MAL 1.02
IBTrACS, Korea, MAL 0.76
STORM, Taiwan, MAL 0.93
IBTrACS, Taiwan, MAL 0.39
STORM, South Asia, MAL 2.66
IBTrACS, South Asia, MAL 2.18

Appendix III



Appendix IV



Zonal wind speed at 850hPa showed stronger correlations with TC activity but did not yield stronger variations after regression