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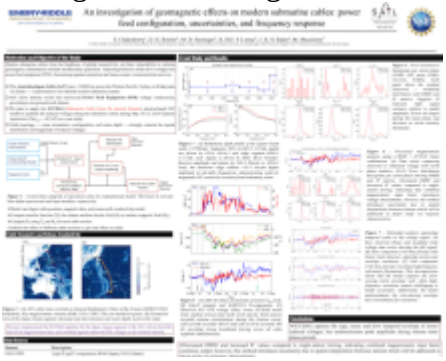
Poster
Modern submarine cables form the backbone of global connectivity, yet their vulnerability to extreme geomagnetic disturbances remains insufficiently quantified. We assess the impact of the May 10–11, 2024 ‘Gannon’ superstorm and the October 2024 geomagnetic storm on a representative modern submarine cable system, using the Australia–Japan Cable (AJC) as a case study. Using the SCUBAS (Submarine Cable Upset By Auroral Streams) modeling framework driven by magnetometer observations, we computed storm-time induced geoelectric fields along the cable route. We show that cable topology, including route orientation, configuration, and water depth, strongly controls the spatial distribution and magnitude of induced voltages. Even under identical geomagnetic forcing, different segments of the same system experience substantially different electrical impact, underscoring the need for route-specific risk assessment. To support operational confidence, we quantify uncertainty arising from gaps in magnetometer coverage over oceanic regions. We quantified uncertainties related to (1) limitations in constraints for water depth along the cable route and (2) data gaps related to limited magnetometer coverage along the cable route. We also conducted spectral coherence analysis of data and model which further shows that the model produces reliable output during largescale voltage excursions associated to magnetic fluctuations. We also examined how the model is performing during different phases of the storm. These results provide an uncertainty-quantified, physics-based framework to inform industry mitigation strategies, monitoring thresholds, and resilience planning for modern submarine cable infrastructure.

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