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weather-based Monte-Carlo simulations for identifying the weather risk of maritime operations

Ocean weather can have a dramatic impact on maritime operations, particularly in areas where weather conditions change rapidly and in extreme ways. Several locations where International Monitoring System (IMS) Hydroacoustic (HA) hydrophone stations are located are characterized by such rapid and extreme variability. For this reason, weather conditions have always been monitored carefully throughout the execution of HA station installation projects. In the special case of HA04 Crozet Islands, located in one of the world's most challenging oceans where the weather is extremely volatile, CTBTO developed an ad-hoc weather risk estimation Monte-Carlo simulation tool which relies on available historical meteorological data, task breakdowns and weather thresholds for the envisaged maritime operations. As this approach proved to be applicable and useful for the estimation of the HA04 installation's weather delay risk, a more widely applicable Monte-Carlo Mission Time Simulation (MMTS) tool was developed in a project with APL University of Washington, in which high-resolution oceanographic hind-cast data are used in conjunction with maritime mission task breakdowns and thresholds to produce predictions of the duration of at-sea operations including weather delays. MMTS was a key instrument in supporting the down-selection of Modular Design Options for Sustainable HA triplets.

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