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Linking interannual and interdecadal fog variability in Atlantic Canada to changes in large-scale atmospheric and marine features

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The main formation mechanism of marine and coastal fog is the cooling of warm and moist air advected over a colder sea surface. The proximity of cold and warm water currents that provides the required contrast makes Atlantic Canada one of the foggiest regions of the world. The frequent resulting low visibility notably disrupts off-shore operations and marine traffic, but also land and air transportation. On longer time-scales, fog can also impact agriculture, insect-borne disease transmission and the global radiative budget. Clouds, including fog, are the greatest source of uncertainty in the current climate projections because of their complex feedback mechanisms. Meteorological records indicate that the occurrence of foggy conditions has been decreasing over the past six decades at most airports in Atlantic Canada, with large internal variability, including interannual and interdecadal variations. Using the airport observations, reanalysis data and climate model outputs, we investigated the various variabilities on the trend, at interannual and interdecadal scales, and attempted to address what caused these changes in fog frequency. Our analyses revealed that the strength and position of the North Atlantic Subtropical High as well as the sea-surface temperature of the cold and warm waters near Atlantic Canada were highly correlated with fog occurrence. In addition, we used the method to predict fog with the current climate model output and project the trends and variability in the different future climate scenarios. The results from this study will be compared with those obtained from other prediction methods and their implications will be discussed.