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Detection of human influence in recent upper ocean temperature and salinity changes

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Evidence is building that increasing anthropogenic greenhouse gases atmospheric concentrations leads to upper ocean warming with consequences on the marine hydrological cycle. In order to confirm the human influence on tropical and subtropical oceanic climate trends for the past decades, we examine recent changes in two variables with high signal-to noise ratio. The mean temperature above 14oC isotherm is taken as a tracer of the upper ocean warming signature while sea surface salinity is used as a tracer of the marine hydrological cycle modifications. We use an original method for climate change detection (called temporal optimal detection method), relying on different noise and signal assumptions compared to the standard optimal detection approach. We find that anthropogenic forcing has acted to warm the subtropical ocean basins from 1960 to 2005, while there is some uncertainty in the equatorial regions. The anthropogenic forcing has also caused a fresher western Pacific warm pool and a saltier subtropical North Atlantic, thereby enhancing inter-basin contrast. The latter suggests an evolution of the fresh water fluxes at tropical latitudes, in the way of an anomalous moisture transport from the Atlantic to the Pacific.