



Ocean Precursors to the extreme Atlantic 2017 hurricane season

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The 2017 Atlantic hurricane season was very active and intense and was the costliest on record. Here, we compare 2017 to the other recent active hurricane seasons of 2005 and 2010 and identify a different driving mechanism. Precursor positive sea surface temperature anomalies (SSTA) in the main development region (MDR, 10-20°N, 20-80°W) favour an active hurricane season in all three years but the causes of these anomalies differ. In both 2005 and 2010, a weakening of the Atlantic Meridional Overturning Circulation in February and March is the primary driver of the precursor SSTA. In contrast, in 2017, a negative wind stress curl anomaly (reducing cold water upwelling) and a positive surface net heat flux anomaly (warming the ocean) that both developed in the north-eastern part of the MDR in April were the main drivers. Additionally, positive surface heat flux anomalies from May to August 2017 at the southern boundary of the MDR acted to strengthen the SSTA. The role of the vertical wind shear is also explored and we find that in all 3 seasons a reduction in shear occurs in concert with the positive SSTA to favour hurricane development. Our results are the first to show that the combination of air-sea heat flux and wind stress related processes can be an important factor in generating precursor positive SSTAs and that these processes were active pre-determinants of the 2017 hurricane season severity. Furthermore, in contrast to other recent strong seasons, in which the SSTAs were evident in March, the anomalously warm ocean surface in 2017 developed between April and July, compounding the challenge of predicting Atlantic hurricane season severity.