



A Double-Thermostad Warm-Core Ring of the Gulf Stream

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An unusual double-thermostad warm-core ring of the Gulf Stream was discovered in the Slope Sea, south of Georges Bank, during the R/V Endeavor Cruise 578 in May 2016. The ring's stratification was peculiar as it included two thermostads at, respectively, 100-200 m ($T=18.5^{\circ}\text{C}$, $S=36.53$) and 250-500 m ($T=16.7^{\circ}\text{C}$, $S=36.35$). Extensive use of satellite data (SST imagery and SSH maps) allowed the complete life story of this ring to be reconstructed, with SST and SSH data mutually corroborating each other. The double-thermostad ring was formed by vertical alignment of two pre-existing warm-core anticyclonic rings of the Gulf Stream. The first ring spawned by the Gulf Stream in February has cooled by 2°C before merging in April with the second ring spawned by the Gulf Stream in March. During vertical alignment of these rings, the warmer ring overrode the colder ring, thereby forming the double-thermostad ring surveyed in May 2016. From ADCP sections through the ring, the upper and lower thermostads had different core relative vorticities of $-0.65f$ and $-0.77f$ respectively where f is the local Coriolis parameter. The different water properties and relative vorticities of the thermostads are consistent with the ring's origin due to a merger of two rings with different origins. This is the first report of such a double-thermostad warm-core ring of the Gulf Stream.