Abstract View

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Variability of Structure and Transport of the Florida Current in the Period Range of Days to Seasonal

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ABSTRACT

Current measurements with five repeated moored arrays were carried out from April 1982 to June 1984 across the Florida Current between West Palm Beach and Grand Bahama Island; a reduced sixth array was continued until June 1985. Transport were calculated directly by vertical integration of the 40-hour low-passed northward current components and extrapolation to the surface using the mean vertical shears ova the extent of the mooring. These transports compared well with 96 transport sections measured by PEGASUS and with transports determined by cable voltage measurements. During 1982–84 the transport variations ranged between 20 and 40 Sv (Sv = 10^6 m^3 s^{-1}) with a mean of 30.5 Sv and standard deviations of the 40-hour low-passed data of ±3 Sv. However, monthly mean deviations from the mean annual cycle were only of order ± 1 Sv, indicating that the climate relevant long-period variations of this current are fairly small. The volume transport shows a continuous spectrum with no particularly energetic period band. Energy distribution is significantly different between seasons, with 19% of the variance in winter concentrated in the 2–10 day period band compared to only 7% in summer. Spectral energy distribution of wind stress varies similarly, and an interpretation of the coherent transport fluctuations can be made by a simple frictional model driven by the local along-channel wind although the resulting frictional time scale appears short.

The annual cycle of Florida Current transport is quite asymmetric, with a broad maximum during spring and summer and then a sharp drop to a minimum in October, the amplitude is 3 Sv. The annual transport cycle shows great similarity with the annual cycle of the along-channel wind stress component and also with the wind stress curl upstream (Caribbean) and downstream (Gulf Stream), suggesting forcing within the Florida Channel or in the vicinity.

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