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Observations of the Tasman Front

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ABSTRACT

Ship and air surveys were conducted in 1978–79 to examine the thermal structure in and near the Tasman Front between Australia and New Zealand at latitudes between Brisbane and Bass Strait. After separation from the continental slope, the East Australian Current feeds into the conjunction of the warm South Coral and cool Tasman Seas. This conjunction is seen as an abrupt change of temperature at all depths peaking at ~ 6°C between 150 and 300 m depth. Extreme north-south excursions of the Tasman Front occur and waters of the Tasman or South Coral Sea origin follow the distortions to form equatorward cyclonic meanders or poleward anticyclonic meanders, respectively. These meanders occupy a latitude span of about 400–700 km and form a wave pattern stretching coherently across the Tasman Sea with a wavelength of ~ 370 km; the average fall in surface dynamic height across the span is 30 cm. Eddy intensification near the Tasman Front products very large transports but this is mostly recirculating, so in the time-averaged sense only ~ 15×10^6 m^3 s^{-1} flows east into the southern limb of the South Pacific subtropical gyre. The abrupt change in the shape and temperature of the thermocline in crossing the Front reinforces Warren's (1970) argument that a zonal jet is maintained near latitude 34°S by baroclinic adjustment in order to connect the western boundary currents which flow along Australia and New Zealand; this composite boundary current is required to close the interior (Sverdrup) wind-driven circulation in the South Pacific. Ship and satellite infrared measurements show that in addition to there being an abrupt change in surface temperature at the Front, the East Australian Current advects very warm water from the north, down the coast and out along the Tasman Front.

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