

EGU21-5315, updated on 25 Jun 2021

<https://doi.org/10.5194/egusphere-egu21-5315>

EGU General Assembly 2021

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## Meridional overturning circulation at 30°S in the Pacific Ocean: 1992, 2003, 2009 and 2017.

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The meridional circulation and transports at 32°S in the Pacific Ocean in 1992 and 2017 are compared with analogous data from 2003 and 2009. The hydrographic data comes from the GO-SHIP database and an inverse box model has been applied with several constraints. In 1992, 2003 and 2017 the pattern of the overturning streamfunction is similar, but in 2009 the pattern of the circulation changes in the whole water column. The horizontal distribution of mass transports at all depths in 1992 and in 2017 changes notably from the “bowed gyre” found in 2009 and resembles that regular shape of 2003. The hydrographic data have also been compared with analogous data obtained from the numerical modelling output of GFDL, ECCO, and SOSE. Results show that the numerical modelling output in the upper layers ( $\sigma^{\theta} < 27.58 \text{ kg/m}^3$ ) have a roughly similar pattern as hydrographic data. This is not the case, however, for deep and bottom layers ( $\sigma^{\theta} > 27.58 \text{ kg/m}^3$ ), where noticeable differences are found. Furthermore, the temperature transport in 2009 ( $0.16 \pm 0.12 \text{ PW}$ ) is significantly lower than in 1992 ( $0.42 \pm 0.12 \text{ PW}$ ), 2003 ( $0.38 \pm 0.12 \text{ PW}$ ) and 2017 ( $0.42 \pm 0.12 \text{ PW}$ ). In addition, the freshwater transport result in 2009 ( $0.50 \pm 0.03 \text{ Sv}$ ) is significantly higher than in 1992 ( $0.26 \pm 0.08 \text{ Sv}$ ), 2003 ( $0.25 \pm 0.02 \text{ Sv}$ ) and 2017 ( $0.34 \pm 0.08 \text{ Sv}$ ). Westward Rossby waves are presumably the dynamical forcing that changes the circulation pattern in 2009.