During winter, cold, salty water flows out of Spencer Gulf (SG; Australia) and onto the shelf due to atmospheric cooling (Q) and the excess of evaporation over precipitation (E-P). The exchange process has been postulated to involve geostrophic adjustment of the density field that occurs when tidal currents and mixing are minimal. To investigate this, a numerical model for the gulf and adjacent shelves was developed and progressively forced with a monthly climatology of evaporation, evaporation and heating, and evaporation, heating and tides. The results obtained for forcing by evaporation alone show a cyclonic circulation within SG, with fresher water from the shelf entering the gulf on the western side and saltier water leaving the gulf on the eastern side. The cross-gulf density field is baroclinically unstable and a series of eddies is formed on the eastern margin with a period of 25 days or so. The gulf-shelf exchange and the propagation of eddies is intensified during the summer when evaporation is largest. With the addition of heating, the cyclonic circulation is intensified during winter and near zero during summer; heating also acts to reduce the size of the eddies that are now formed only during winter. With the addition of tides, eddies are now only formed during the anomalous 14 day, spring-neap cycle, when tidal currents are near zero. Observations support the existence of these eddies which we name Speddies as cousins to Mediterranean eddies (Meddies).