Estimation of Turbulence in an East Frisian Tidal Channel

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Turbulence is important for mixing processes in the ocean. Especially in shallow water regions with high current velocities, e.g. in a tidal channel, vertical mixing is strong. In order to determine the available energy for turbulent mixing of the water column, the equation of turbulent kinetic energy (TKE), with its production rate P and its dissipation rate ε is needed.

In the work presented, production rate P and dissipation rate ε were estimated using current measurements from an Acoustic Doppler Current Profiler (ADCP). In addition, the dissipation rate ε was also derived from density estimations obtained by a Conductivity Temperature Depth probe (CTD). Both measurements were conducted aboard the Research Vessel Senckenberg which was positioned next to a Time Series Station in an East Frisian tidal channel in the southern North Sea. Data was collected during one tidal period in November 2011.

Here, the results of the different methods are compared and discussed.

Comparison between the production rate P and dissipation rate ε shows that always more kinetic energy of the turbulent current is supplied than dissipated. Hence we reason that the remaining kinetic energy is used for mixing and the continuation of turbulence.