Geophysical Research Abstracts
Vol. 20, EGU2018-8264, 2018
EGU General Assembly 2018

Hydrographic regime of coastal part of the Caspian Sea adjacent to Zhayik River mouth

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We present here results of two hydrographic surveys conducted on April 9-12, 2016, and April 14-17, 2017, in the northernmost coastal area of the Caspian Sea adjacent to the Zhayik River (also known as the Ural River) delta. The area is poorly covered by historical data. Massive freshwater discharge from the river spreading over extremely shallow terrain, with the 2 m isobath located at 10 to 15 km away from the shore, constitutes rather peculiar oceanographic settings. Both field surveys reported here corresponded to the beginning of the spring flood on the river and, hence, represented conditions of high river discharge.
The thermohaline fields, as well as the concentrations of suspended and dissolved organic matter, were measured at high resolution using a pump-through CTD system and an ultraviolet fluorescent LiDAR. In addition, current velocity was registered at a number of mooring stations.
The measurements documented general features of the hydrographic regime in the area, but also revealed some interannual differences. In both cases, the marine environment was brackish, but in 2016, the maximum salinity values were as high as 7 psu, while in 2017 when the river discharge rates were higher, salinity in the study region never exceeded 4 psu. In both years, the water columns were fully mixed vertically, presumably because of shear-generated turbulent mixing resulting from swift currents (typically, over 30 cm/s) propagating over shallow bottom. The current measurements revealed strong contribution from inertial motion, superimposed on the cyclonic, wind-driven general circulation. The latter was developed stronger in 2016 than 2017 because of more energetic easterly wind forcing.
Comparative analysis of the suspended sediment and dissolved organic matter concentrations indicated that most of the suspended matter in the study area originated from re-suspension from the bottom rather than from the river. The characteristic pH values of the sea water in 2017 were higher than those in 2016, when the highest pH values were observed in the seaward part of the study area. In 2017, in contrast, the pH dropped from the river mouth offshore, and the largest values were recorded in the fresh waters of the lower reaches of the river. In 2017, the content of dissolved inorganic phosphorus, both in river water and in the sea, was lower than that during the survey of 2016. It is likely that in 2017, low content of phosphorus served as the limiting factor of photosynthetic activity.