Geophysical Research Abstracts
Vol. 17, EGU2015-10672, 2015
EGU General Assembly 2015

CISOCUR – Residence time modelling in the Curonian Lagoon and validation through stable isotope measurements

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The spatial pattern of the hydrodynamic circulation of the Curonian lagoon, the largest European coastal lagoon, is still little understood. In absence of automatic current registration data all the existing models relied mostly on such data as water levels leaving high level of uncertainty.
Here we present CISOCUR, a new project financed by European Social Fund under the Global Grant measure. The project applies a new methodology that uses the carbon stable isotope (SI) ratio of C12 and C13 that characterize different water sources entering the lagoon and may be altered by internal kinetic processes. Through the tracing of these isotope ratios different water masses can be identified. This gives the possibility to validate several hypotheses of water circulation and validate hydrodynamic models. In particular it will be possible to 1) trace water masses entering the lagoon through the Nemunas and the Klaipeda strait; 2) test the hypothesis of sediment transport mechanisms inside the lagoon; 3) evaluate the importance of physical forcing on the lagoon circulation. The use of a hydrodynamic finite element model, coupled with the SI method, will allow for a realistic description of the transport processes inside the Curonian lagoon. So the main research goal is to apply the stable isotope tracers and a finite element model to determine the circulation patterns in the Curonian lagoon.
Here we show how the SI analysis was used to validate the hydrodynamic model on the basis of residence time. The average residence time of the Nemunas waters is estimated through SI data and is then compared with the model data computed through standard algorithms. Seasonal changes of carbon content are taken care of through a preliminary application of a carbon kinetic model. The results are compared to literature data.