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Utemeljeno 1861

Zagreb, 25. 04. 2017.

OBAVIJEST

Dana **03.05.2017.** (pon) u **13:15 sati** održat će se na Geofizičkom odsjeku PMF-a seminar:

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Water level forecast and the mobile barriers in Venice

ABSTRACT: The city of Venice is impacted by intermittent flooding due to storm surges every year. Granted that the possibility of a severe flooding existed also in the past (order of 100 years), the situation has worsened mainly because of two reasons. The first is the sinking of the town due to natural (3 cm) and anthropogenic (9 cm) subsidence in the 20th century, the latter due to local water extraction from the underground aquifers in the period 1930-1960 (Carbognin et al., 2004). The second reason is the sea level rise that has been estimated in the 20th century at 11-13 cm (Tsimplis et al., 2011). Therefore, the estimates for the 21st century derived from the last IPCC report are a strong reason for concern.

Since 2002 ISMAR started a collaboration with the Institute for the storm surge forecast and warning (ICPSM) of the Venice municipality, in order to provide an operational forecast system. This system is based on the use of the Shallow water HYdrodynamic Finite Element Model (SHYFEM). The model solves the shallow water equations on a finite element grid covering the Mediterranean Sea. The simulations are forced with wind and atmospheric pressure fields provided by ECMWF. The model computes the surge for six days and a half in advance. The surge near Venice is then added to the astronomical tide, which is computed by means of harmonic analysis, in order to forecast the total sea level. This forecast is further corrected, using the latest sea level observations, by means of a post-processing routine based on neural networks. Finally a last simulation is run inside the Venice lagoon (Figure 2), forced at the three inlets with the previously computed sea level. The model has an error of around 5 cm in the first forecast day, growing to around 10 cm in the fifth day.

To further improve the modelling capabilities scatterometer data can be used to correct the wind biases of a global atmospheric model by tuning the wind fields. The capability of such an unbiased wind is tested against those of a high resolution wind, produced by a local non-hydrostatic model. While scatterometer data can be used to improve the surface forcing of the hydrodynamic model (i.e., the wind stress), altimeter data can be used to improve the accuracy of the initial state of the model simulation.

In the last years the works for the mobile barriers (MOSE) have been started that should protect the city of Venice from flooding after their completion in 2016. These barriers will be closed at a safeguarding level of 110 cm, a level when large parts of Venice will start to be flooded. In the last years this would have led to around 10-20 closing per year. A precise water level forecast will be crucial for the correct operation of the MOSE gates.

With the new estimates of sea level rise this closing frequency will change. Depending on the exact modality of the forecast, with a sea level rise of 50 cm the gates will have to be closed between 300 and 400 times a year (Umgiesser and Matticchio, 2006). This translates to about one closure per day in the average.

The implications of this situation still have to be evaluated. It seems, however, quite impossible that both the MOSE structures and the ecosystem of the lagoon will be able to handle this closing frequency. Other solutions will have to be studied that will be more compatible with the future developments and that will have to look at a situation where the MOSE might be exchanged with other flood protection schemes. A total closure of the Venice lagoon is certainly one of these options.

Pozivaju se studenti, apsolventi i svi zainteresirani da prisustvuju predavanju, koje će se održati u **predavaoni P2** Geofizičkog odsjeka PMF-a, Horvatovac 95, Zagreb.