Geophysical Research Abstracts
Vol. 20, EGU2018-9835-2, 2018
EGU General Assembly 2018

Analysis of Aegean Sea coastal upwelling system using in-situ visualization integrated Regional Earth System Model (RegESM)

Ufuk Utku Turuncoglu (1), Baris Onol (2), and Ceyhun Ozcan (2)

(1) Istanbul Technical University, Informatics Institute, Istanbul, Turkey, (2) Istanbul Technical University, Aeronautics and Astronautics Faculty, Meteorological Engineering, Istanbul,

The two-way complex interaction between coastal wind-driven upwelling systems and atmospheric boundary layer have a big impact in hydrodynamics and ecosystem of the seas and the climate system of the surrounding region. The previous studies reveal that the costal upwelling systems can modify local and remote weather pattern and affect the stability of the atmospheric boundary layer by changing heat flux components over the sea. For better understanding coastal wind-driven upwelling systems that occur in a very short time scales (i.e. days and week) and their influence on the atmospheric condition, the fully-coupled multi-component and multi-scale non-hydrostatic modelling systems need to be utilized. Due to the complex feedback mechanism in the air-sea interface, the analysis of the direct and indirect effects of the upwelling event requires detailed analysis of the model results in a very high temporal and spatial resolution, which requires novel numerical modeling systems and data processing approaches. Besides to the conventional data analysis approach, the in-situ visualization and co-processing approaches allow rresearchers to analyze the simulation output simultaneously during the numerical simulations. The coupling of computation and data analysis helps to facilitate efficient and optimized data analysis and visualization pipelines and boosts the data analysis workflow.

The present study aims to investigate complex relationship between Etesian wind and Aegean Sea coastal upwelling system using the novel in-situ visualization integrated regional earth system model (RegESM). For this purpose, we designed a set of fully coupled atmosphere-ocean model simulations for selected strong upwelling events and analyze the results of model components in a very high temporal (i.e. in an interval of 6 minutes) and spatial resolution by utilizing in-situ visualization component. In this case, the vast amount of data produced by the high-resolution atmosphere and ocean model components are transferred to the in-situ visualization component (ParaView, Catalyst) through the driver component developed by Earth System Modeling Framework (ESMF). The standardized and generic integration of the driver component and the in-situ visualization tool basically provides easy to use fully integrated modeling environment to analyze fast-moving processes such as coastal upwelling systems, extreme events, turbulence and air-sea interaction. The preliminary results indicate that the newly designed modeling system reveals very important information about wind-driven coastal upwelling system over Aegean Sea and regional atmospheric conditions.

Acknowledgement: This study has been supported by a research grant (116Y136) provided by The Scientific and Technological Research Council of Turkey (TUBITAK). The computing resources used in this work were provided by the National Center for High Performance Computing of Turkey (UHeM) under grant number 5003082013 and 5004782017. The Quadro K5200 used for the development of the prototype version of the modeling system was donated by the NVIDIA Corporation as part of the Hardware Donation Program. The author extends his grateful thank to Rocky Dunlap and Robert Oehmke from NOAA/ESRL, and CIRES, Boulder, Colorado, Gerhard Theurich from Science Applications International Corporation, McLean, Virginia and Andy C. Bauer from Kitware Inc., USA for their very useful suggestions and comments.