Geophysical Research Abstracts
Vol. 14, EGU2012-6223-1, 2012
EGU General Assembly 2012

The oil body formation and breakup in the compound vortex

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The flows in the Ocean and Atmosphere combine different types of motion: streams, jets, wakes, vortices and waves. When flows transport solid bodies or immiscible admixtures picturesque flow patterns are revealed and indicated the type of flow. Different spiral patterns visualize vortex flow structure.
In experiments is studied the transport of finite volumes of immiscible admixture introduced on the free surface of water drawn into the vortex motion in the vertical cylindrical container. The basic medium was tap water, preliminary degasified to make the visualization less difficult. The fixed volume of immiscible admixture (castor or sunflower oil) is introduced on the quiescent free surface of water inside the cylindrical container. The generation of compound vortex in the cylindrical container started after all the disturbances caused by deposition of the oil volume are damped. In compound vortex the flow oil patch with smooth boundary placed onto free surface is transformed into a set of spiral arms and separate drops contacting with the central oil volume. The droplets are separated from the central spot and slowly travel towards the container sidewall. With time, the spot is transformed into pronounced spiral arms. The most part of oil under the influence of vortex flow is gathered into the central volume contacting with the free surface. This volume is called “the oil body”. On the lower frequencies of disk rotation and respectively slow flow gyration the oil body has smooth boundaries with water and air. The growth of disk rotation frequency leads to more pronounced deformation of the contact surface between liquid and air, the boundary of the oil body and water then is covered by small pimples. At the further increase of disk rotation frequency the oil body comes to the breakup, the water-oil boundary become irregular and on the lowest part of the oil body the analog of foam appears (the water-oil emulsion).
The work is supported by Ministry of Education and Science RF (Goscontract No. 16.518.11.7059).