Geophysical Research Abstracts
Vol. 14, EGU2012-8147, 2012
EGU General Assembly 2012

Transport of Substances on Different Stages of Processes Initiated by Free Fallen Drop Impact on Surface of Quiescent Water

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Collision of a free fallen drop with a surface of quiescent layer of water initiates a sequence of processes including initial shock, formation of cavern and crown with a chevron edge emitted small water drops, wide central trough surrounding by a train of running surface circular capillary waves, splash, secondary cavern collapsing with a streamer discharge and gradual decal of all disturbances. Fine structure of the drop splashes and transport of substances carrying by the drop inside accepting target fluid are studied by methods of direct registering of flow images by fast video- and photo cameras. Different directions of observations were realized that are side, top and bottom view of flow patterns. Flow patterns produced by clean and coloured water, alcohol (changing the surface tension) and oil drops were investigated. Attention was concentrated on small scale processes dynamics studying which produce fast variations of water surface shapes with sharp local irregularities. Shapes and textures of craters and surrounding rim surfaces as well as coloured filaments of a drop substance inside the fluid body were registered and analyzed. Two groups of flows with relatively large scales defined by the drop diameter and very fine scales were identified. It is supposed that short living and fast changing flow components are result of strong short-acting forces impact. Their manifestations depend on surface tension on the boundaries fluid-fluid and fluid-air. Effects of surface tension gradients on the drop dye propagation pattern are also demonstrated and discussed. Experiments were performed on set-up USU "HPC IPMec RAS" under support of Ministry of Education and Science RF (Goscontract No. 16.518.11.7059).