**Caption list for the Supplementary movies:**

**movie 1** − The video demonstrates the formation of a two-zone flow structure: the central zone with an intense symmetrical flow, located around the source, and the stagnant zone at the surface periphery, where the multi-vortex flow structure develops. The experimental conditions are as follows: M1 source, q=0.005 g/s, C=5%; the interface contains a layer of oleic acid molecules of surface concentration ; a cuvette diameter is 17 cm. The source is turned on at the second second of the video. The frame summation procedure begins at the fifteenth second, to underline the flow structure. Double speed playback.

**movie 2** − The video demonstrates the experiment, where the central zone does not appear and the multi-vortex flow structure develops over the entire interface. The experimental conditions are as follows: M1 source, q=0.03 g/s, C=2.5%; the interface contains a layer of oleic acid molecules of surface concentration ; a cuvette diameter is 17 cm. The source is turned on at the second second of the video. The frame summation procedure begins at the fifteenth second, to underline the flow structure. Double speed playback.

**movie 3** − The video demonstrates the flow structure in the volume, being observed in the vertical diametral section of a cylindrical cuvette, at E<1, when two-zones flow pattern exists at the interface. The yellow arrow indicates the interface location. The inset demonstrates the azimuthal position of the light sheet relative to the vortex structure. It is seen that the flow dives under the stagnant zone and the flow at the interface within the stagnant zone is directed towards the periphery of the cuvette. Real time playback.

**movie 4** − The video demonstrates the flow structure in the volume, being observed in the vertical diametral section of a cylindrical cuvette, at E<1, when two-zones flow pattern exists at the interface. The yellow arrow indicates the interface location. The inset demonstrates the azimuthal position of the light sheet relative to the vortex structure. It is seen that the flow dives under the stagnant zone and the flow at the interface within the stagnant zone is directed towards the center of the cuvette. Real time playback.

**movie 5** − The video demonstrates the flow structure at the interface and in the volume being observed in a horizontal section parallel to the interface. The vertical position of a light sheet is stepwise shifting down with time. The current distance between the interface and the light sheet is given in the video caption. It is seen that the multi-vortex structure, being of maximum intensity and size at the interface, quickly damps with depth, giving place to axisymmetrical radial flow at depth of about 2-3 mm. Double speed playback.

**movie 6** − The video demonstrates the flow structure at the interface containing a layer of stearic acid molecules. It is seen that the formation of two-zone flow structure is not accompanied by the formation of the multi-vortex flow within the stagnant zone, which remains immobile. The experimental conditions are as follows: S source, d=1.8 mm, h=1.5 mm; initial surface concentration ; a cuvette diameter is 8 cm. Double speed playback.

**movie 7** − The video demonstrates the flow structure at the interface containing a layer of oleic acid molecules, obtained under the same experimental conditions as in movie 6. Initial surface concentration of oleic acid is . It is clearly seen that a multi-vortex flow is forming within the stagnant zone. Double speed playback.