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Penetration Technology for Investigation of Subglacial Lake Vostok

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The results of operations to penetrate into the subglacial lake proved that with the differential pressure of -0.2 MPa, lake water ingresses into the borehole through the annular clearance between the drilling assembly and the borehole walls, rising up to 15 meters above the drilling assembly. While rising through the annular space, the water mixes up with the filling liquid. This creates an emulsion due to freon presence in the borehole, which acts as a surfactant. In order to enhance environmental safety during investigations of Subglacial Lake Vostok, it was decided to drill a new access borehole using organosilicon fluid as the filling liquid. Decreasing the level of water that ingresses into the borehole upon its completion requires that the diameter of the lower section of the borehole is increased at least 2-2.5 times before the penetration into the lake.

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