# Macroscopic Nonlocal Correlations by Data of the Baikal Experiment

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**Abstract.** Consideration of macroscopic entanglement in the framework of action-at-a-distance electrodynamics leads to rather simple description of macroscopic nonlocal correlations between random dissipative processes in the source and detector. These correlations have both the retarded (time respected) and advanced (time reversed) components. In the case of their exact symmetry the conditions of their interference appear, and the instantaneous correlations are observed (which is ordinary case in most experiments with microscopic entanglement). In macroscopic domain the advanced component through an absorbing medium can exceed the retarded one. Therewith due to diffusion entanglement swapping the retardation and advancement can be very large. Such correlations were observed in the previous lab experiments with some large-scale random heliogeophysical processes. But these experiments are very difficult in a usual laboratory. The experimental problem is elegantly solved under deep sea conditions. The Baikal long-term experiment has started in 2012 at Baikal Deep Sea Neutrino Observatory. It aims, first, study of nonlocal correlations between the electrode detectors at different horizons in the lake and spaced at 4200 km one in the land laboratory, and second, study of correlations between the detector signals and large-scale natural dissipative processes with big random components. Several annual series demonstrated that detector signals respond to the random heliogeophysical (global) processes and causal connection of the signals directed downwards: from the Earth surface to the Baikal floor. This nonlocal causal connection proved to contain considerable advanced component, exceeding retarded one. This excess depends on the mass of the absorbing medium separating the detectors. Nonlocal nature of observed correlations has been confirmed by violation of the steering inequality with combination of solar and geomagnetic source-processes. Next, advanced/retarded nonlocal correlations of the detector signal with some regional random source-process were revealed. A remarkable result has been displaying of the advanced response of nonlocal correlation detector to the earthquake as an example of powerful random dissipative process. Much weaker, but continuous source-process caused nonlocal detector response proved to be long-period turbulence in in the upper layer of the lake. The possibilities of the forecasts of random components of solar and hydrological activities have been demonstrated. The strongest macroscopic nonlocal correlations are observed at extremely low frequencies; therefore, our attention was focused on the long-period domain, tens and hundred days. Recently we paid attention to relatively short periods and discovered very strange daily variation in the signals of both detectors. The daily variation is completely absent in the temperature and sea current at the depths of both detectors, therefore their signals are not related (locally or even nonlocally) to any hydrological processes. The causal connection of the signals is directed downwards and it is synchronous (that is instantaneous within experimental resolution). Moreover, this variation turned out synchronous with that one recorded by the remote lab detector (at the longitude difference 67°), that is it occurs in universal time, and therefore cannot be associated with any meteorological or geomagnetic daily variations. The source of this signal in nonlocal correlation detectors is still mysterious.

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