A Study of a Local Time Effect on Moving Sources of Fluctuations

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This work presents an experimental investigation of a possible mechanism causing local time effects, with the aid of moving sources of fluctuations. The results show that the measurement system, consisting of two separated sources of fluctuations moving in a near-Earth space, can detect its own motion in form of a local time effect, or in other words, we can determine uniform and rectilinear motion of an isolated system on the basis of measurements made inside the system.

1 Introduction

If at any two places on the Globe we make two synchronous records of fluctuations in any natural processes, then by a standard method [1-4] we can find that shape of the fine structure of histograms, constructed on the basis of short segments of time series, is most similar for such pairs, that are separated by a time interval equal to the local time difference for the places of measurements. Because of this the phenomenon is called the local time effect. At the present time it is known that the effect exists for any distances between places of measurements, ranging from the highest possible on the Earth down to one metre [5, 6]. The local time or longitudinal difference implies dependence of the fine structure of the histograms on the Earth's rotation around its axis. In relation to ambient space this means that after a time interval equal to the local time difference measurement, system No. 2 appears in the same place where system No. 1 was located previously, or that measurement system No. 2 will be oriented in the same direction as system No. 1 was oriented before. The same places or directions mean that the same conditions prevail and, consequently, a similar shape for the histograms.

The existence of a local time effect is closely connected with space-time heterogeneity. Really the effect is possible only if the experimental setup, consisting of a pair of separated sources of fluctuations, moves through heterogeneous invariable space. It is obvious that for the case of homogeneous space the effect cannot exist. Existence of a local-time effect for some space scale can be considered as evidence of space-time heterogeneity, which corresponds to this scale.

So, to observe the local time effect we need *heterogeneous invariable* space and a pair of fluctuation sources on a fixed spatial base, which *moves synchronously* through that space. All phenomenology of the local time effect was obtained due to rotational motion of the Earth. The present investigation studies the local time effect for the case of the measurement system moving independently of the rotational motion of the Earth. In other words, we try to ascertain if an isolated measurement system, consisting of two separated sources of fluctuations, can detect its own motion in the form of a local time effect.

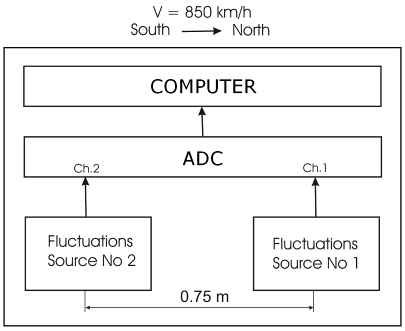

Fig. 1: Simplified diagram of the experiment with moving sources of fluctuations.

2 Experiment description and results

A simplified diagram of the experiment with moving sources of fluctuations is presented in Fig. 1. The measurement system consists of two separated sources of fluctuations, which are oriented in the line of the velocity vector of the plane in such a way that source No. 2 follows source No. 1. The sources are separated by the fixed distance of 0.75 m. Signals of fluctuations were digitized by means of an analogue-to-digital converter (ADC) via a USB interface connected to a personal computer running appropriate data acquisition software. The whole system was mounted inside the plane moving with a velocity of $V = 850$ km/h along an Earth meridian from South to North.

The digitizing frequency used for all series of measurements was 100 kHz. One record consists of 500 kpts per channel. This allowed acquisition of two synchronous sets of 50-point histograms. The maximum length of each set was 10,000 histograms. Consequently, the duration of a 50-point histogram is 0.5 ms, so that all local-time values in the experiment can be determined to an accuracy of ± 0.5 ms.

The local time value $\triangle t$ for the experiment is the time

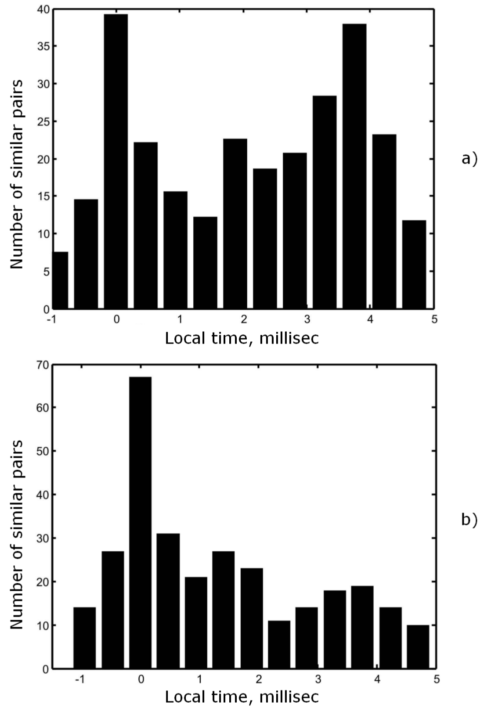

Fig. 2: a) Interval distributions for moving, and b) motionless ground-based measurement systems. Measurements were carried out at the same time each day and at the same spatial orientation of the measurement systems (South-North).

interval in which the plane can travel a distance of 0.75 m. Calculation shows that this value is $\triangle t = 3.18$ ms.

Along with the moving experiment, a motionless ground-based one was carried out. For this experiment we used the same experimental setup and exactly the same orientation of fluctuation sources. The motionless measurements were carried out at the same daytime as for measurements with the moving system.

The intervals distribution for the motionless ground-based experiment is presented in Fig. 2b). The distribution has a single peak at the zero interval. The pattern of this distribution is exactly the same as that reported in work [7] for a meridian direction.

The interval distribution for the moving measurement system is shown in Fig. 2a). Like the distribution in Fig. 2b), in this case we also have zero-peak, except this peak on the distribution has a maximum at 3.5 ± 0.5 ms, which is in good agreement with the calculated local time value $\triangle t = 3.18$ ms and can be linked to motion of the measurement system.

Both interval distributions presented in Fig. 2 represent an average of five series of measurements. Ordinates in Fig. 2 are defined to 7–10%.

3 Conclusions

The results confirm the hypothesis that a local time effect is caused by motion of the measurement system in heterogeneous invariable space. The opposite statement also is true: a measurement system moving in near-Earth space can detect its own motion in the form of a local time effect. It is interesting to note that by means of the method described above, it is possible to determine uniform and rectilinear motion of an isolated system on the basis of measurements made inside the system.

The zero-peak for both interval distributions in Fig. 2, aren't linked to plane motion and are caused only by the spatial orientation of the measurement system [7]. Investigation of the nature of the zero-peak is one of our immediate tasks.

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References

1. Shnoll S.E., Kolombet V.A., Pozharskii E.V., Zenchenko T.A., Zvereva I.M. and Konradov A.A. Realization of discrete states during fluctuations in macroscopic processes. *Physics-Uspekhi*, 1998, v. 41(10), 1025–1035.
2. Shnoll S.E., Zenchenko T.A., Zenchenko K.I., Pozharskii E.V., Kolombet V.A. and Konradov A.A. Regular variation of the fine structure of statistical distributions as a consequence of cosmophysical agents. *Physics-Uspekhi*, 2000, v. 43(2), 205–209.
3. Shnoll S. E. Periodical changes in the fine structure of statistic distributions in stochastic processes as a result of arithmetic and cosmophysical reasons. *Time, Chaos, and Math. Problems*, No. 3, University Publ. House, Moscow, 2004, 121–154.
4. Panchelyuga V. A. and Shnoll S. E. Experimental investigation of spinning massive body influence on fine structure of distribution functions of alpha-decay rate fluctuations. *Space-Time Structure*, (Collected papers), TETRU, Moscow, 2006, 328–343.
5. Panchelyuga V. A., Kolombet V. A., Panchelyuga M. S. and Shnoll S. E. Local-time effect on small space-time scale. *Space-Time Structure. Algebra and Geometry.* Lilia-Print, Moscow, 2007, 531–537.
6. Panchelyuga V. A., Kolombet V. A., Panchelyuga M. S. and Shnoll S. E. Experimental investigations of the existence of local-time effect on the laboratory scale and the heterogeneity of space-time. *Progress in Physics*, 2007, v. 1, 64–69.
7. Panchelyuga V. A. and Shnoll S. E. On the dependence of local-time effects on spatial direction. *Progress in Physics*, 2007, v. 3, 51–54.