



## Do the current sheets in the magnetic clouds contain elevated helium abundance?

Yuri Yermolaev (1), Irina Lodkina (1), Michael Yermolaev (1), Maria Riazantseva (1), Liudmila Rakhmanova (1), Natalia Borodkova (1), Elena Grigorenko (1), Igor Veselovsky (1,2), Yulia Shugay (2), Vladimir Slemzin (3), and Denis Rodkin (3)

(1) Space Research Institute (IKI), Russian Academy of Sciences, Moscow, Russian Federation (yermol@iki.rssi.ru), (2) Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russian Federation, (3) Lebedev Physical Institute, Russian Academy of Sciences, Moscow, Russian Federation

As have been obtained by theoretical and experimental investigations, the heavy ions can play important role in the development of current structures in various space plasmas. Recently, on the basis of 1976-2016 measures in OMNI database we showed for the first time that the magnetic clouds (MCs) have maximal helium abundance ( $N\alpha/Np$ ) and minimal  $\beta$ -parameter (maximal IMF magnitude, B) in the center of them (Yermolaev et al., 2018a). These results may be explained by suggestion that electric current in center of MCs contains elevated helium abundance (Yermolaev et al., 2018b, c) and support early obtained findings for other space plasmas. The small variations of  $N\alpha/Np$  and  $\beta$  values across phenomenon and the weaker  $N\alpha/Np$  vs.  $\beta$  dependence in Ejecta compared to MCs can be associated not only with the differences in the processes of their formation on the Sun, but also with the conditions of their observation near the Earth (spacecraft trajectory relative to ICME axis) (Yermolaev et al., 2017). The work was in part supported by the Russian Foundation for Basic Research, grant 19-02-00177a.

### References:

1. Yermolaev, Y.I., Lodkina, I.G., Nikolaeva, N.S., Yermolaev, M.Y.: 2017, Dynamics of Large-Scale Solar-Wind Streams Obtained by the Double Superposed Epoch Analysis: 2. Comparisons of CIRs vs. Sheaths and MCs vs. Ejecta. *Solar Phys.* 292:193. DOI: 10.1007/s11207-017-1205-1
2. Yermolaev Yu. I., I. G. Lodkina, M. Yu. Yermolaev, M. O. Riazantseva, L.S. Rakhmanova, N. L. Borodkova, Yu. S. Shugay, V. A. Slemzin, I. S. Veselovsky, D. G. Rodkin: 2018a, Dynamics of large-scale solar-wind streams obtained by the double superposed epoch analysis. 4. Helium abundance, <http://arxiv.org/abs/1807.03579>
3. Yermolaev, Yuri I., Irina G. Lodkina, Michael Yu. Yermolaev, Natalia L. Borodkova, Maria O. Riazantseva: 2018b, Temporal profiles of parameters in different large-scale types of solar wind, 15th Solar Wind Conference, 18 - 22 June, Brussels, Belgium, DOI: 10.13140/RG.2.2.33710.00327
4. Yermolaev, Yu. I., I. G. Lodkina, M. Yu. Yermolaev, E. E. Grigorenko, N. L. Borodkova, M. O. Riazantseva, L. S. Rakhmanova: 2018c, Helium abundance profiles in the large-scale solar-wind phenomena, AGU Fall Meeting, Washington, 10-14 Dec DOI: 10.13140/RG.2.2.14610.91842