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Similarities and distinctions of CIR and Sheath

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On the basis of OMNI data and our catalog of large scale solar wind (SW) streams during 1976-2000 [Yermolaev et al., 2009] we study the average temporal profiles for two types of compressed regions: CIR (corotating interaction region – compressed region before High Speed Stream (HSS)) and Sheath (compressed region before fast Interplanetary CMEs (ICMEs), including Magnetic Cloud (MC) and Ejecta). As have been shown by Nikolaeva et al, [2015], the efficiency of magnetic storm generation is ∼50% higher for Sheath and CIR than for ICME (MC and Ejecta), i.e. reaction magnetosphere depends on type of driver. To take into account the different durations of SW types, we use the double superposed epoch analysis (DSEA) method: rescaling the duration of the interval for all types in such a manner that, respectively, beginning and end for all intervals of selected type coincide [Yermolaev et al., 2010; 2015]. Obtained data allows us to suggest that the formation of all types of compression regions has the same physical mechanism irrespective of piston (HSS or ICME) type and differences are connected with geometry and full jumps of speed in edges of compression regions. If making the natural assumption that the gradient of speed is directed approximately on normal to the piston, CIR has the largest angle between the gradient of speed and the direction of average SW speed, and ICME - the smallest angle. The work was supported by the Russian Foundation for Basic Research, projects 13-02-00158, 16-02-00125 and by Program of Presidium of the Russian Academy of Sciences.

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