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EVOLUTION OF THE SOLAR WIND STRUCTURE IN THE OUTER HELIOSPHERE

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Shocks and interaction regions play very important roles in the evolution of large-scale solar wind structure in the outer heliosphere. This study is based on (1) plasma and magnetic field data observed from Voyager and Pioneer spacecraft, and (2) a quantitative magnetohydrodynamic simulation model. An interaction regions bounded by a forward and a reverse shock begin to form near 1 AU at the leading edges of a large-scale stream. The total pressure in the region is greater than the ambient pressure by a factor of ten of more. Large jumps in pressure remain as a prominent feature of the interplanetary structure even as the jumps in flow speed become less visible in the outer heliosphere. The propagation of the forward and reverse shocks widens the dimension of an interaction region. As a result, two interaction regions belonging to neighboring streams coalesce to form a merged interaction region (MIR). Collision and merging of shocks take place during the coalescence process. Two MIRs can themselves merge again at greater heliocentric distances. Simulation results agree well with spacecraft observations, and they explain major restructuring of the solar wind in the outer heliosphere.