

The model of solar wind polytropic flow patterns

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Abstract

We have developed a model of the polytropic radial solar wind flow patterns. The main novelty of the model is that it admits non-isothermal flow pattern solutions. Corresponding, analytic solutions have been obtained which allow precise parametrisation of the flow sub and supersonic regimes and temperature and density radial profiles for different values of the polytropic index (including cases of partially ionised plasmas). In analogy with the standard Parker's solar wind, the presence of the flows before and after the sonic point is mathematically treated as a conjunction of the two flow states of the solar atmosphere. The physical content of the flow around the critical point is analysed rigorously. The results of the studies enable drawing of the wide class of the possible solutions for the solar wind, their subsequent potential to be used for the either for the numerical modelling of the solar wind and solar radio burst studies is explored.