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General Method for Describing Three-Dimensional Magnetic Reconnection[1] VIACHESLAV TITOV, Predictive Science, Inc., TERRY FORBES, University of New Hampshire, ERIC PRIEST, University of St. Andrews, ZORAN MIKIC, JON LINKER, Predictive Science, Inc. — A general method for describing magnetic reconnection in arbitrary three-dimensional magnetic configurations is proposed. The method is based on the field-line mapping technique previously used only for the analysis of magnetic structure at a given time. This technique is extended here so as to analyze the evolution of magnetic structure. Such a generalization is made with the help of new dimensionless quantities called "slip-squashing factors". Their large values define the surfaces that border the reconnected or to-be-reconnected magnetic flux tubes for a given period of time during the magnetic evolution. The proposed method is universal, since it assumes only that the time sequence of evolving magnetic field and the tangential boundary flows are known. We illustrate our method for several examples and compare it with the general magnetic reconnection theory, proposed previously by Hesse and coworkers. The new method admits a straightforward numerical implementation and provides a powerful tool for the diagnostics of numerical data obtained in theoretical or experimental studies of magnetic reconnection in space and laboratory plasmas.

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