Reconstruction of the reconnection rate from magnetic field perturbations in an incompressible plasma

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We present a theoretical model to describe the behaviour of flux transfer events. Based on a time-dependent Petschek-type model of reconnection we are able to evaluate the magnetic field configuration and the flow components, as well as the shape of the Petschek shocks. We consider two different kinds of hypothetical measurements, namely along a profile $B_z(x)$ and along a trajectory $B_z(t)$. Our aim is to solve an inverse problem to achieve the reconnection rate from the magnetic field data. By using a discrete Fourier transformation, we are able to calculate the magnetic field along a certain profile $B_z(x)$. Out of this profile, we reconstruct the reconnection electric field at the reconnection site. This is an ill-posed inverse problem, which we treat with the method of regularisation. With this method, we can reconstruct the reconnection electric field out of profiles. But realistic satellite measurements are always trajectories and we use the so-called Cagniard-deHoop method to calculate the magnetic field configuration along a trajectory $B_z(t)$. The solution is given as a convolution integral, which is a well-known problem in the theory of inverse problems. By using a regularisation operator, we can reconstruct the reconnection electric field for different initial electric field configurations. It is shown that this method works well for distances up to 50 times the height of the outflow region.