CAPAL: Hybrid model for the Coupling of an Asymptotic Preserving scheme with the Asymptotic Limit model .

The purpose of this project is to construct a numerical method for strongly anisotropic diffusion equations such as those occuring in the modeling of magnetically confined plasmas. Indeed, the diffusion coefficient of charged particles is very different if considered in the direction of the magnetic field lines or perpendicular to them. This large anisotropy induces severe numerical difficulties. In [1, 2] an Asymptotic Preserving scheme (AP) has been developed for an elliptic problem describing the electric potential in the ionospheric plasma. The schemes permits an accurate resolution for all values of the anisotropy parameter. However, for large anisotropies,

it can be numerically more efficient to solve the problem obtained in the limit of an infinite anisotropy. Therefore, an optimal strategy for problems where the anisotropy varies from moderate to large values is thus to couple the AP-scheme to the limit model through a domain decomposition approach. The goal of the present project is therefore to develop such a method on the basis of a Dirichlet-Neumann strategy at the interface.

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Références

[1] P. Degond, F. Deluzet, C. Negulescu, *An asymptotic preserving scheme for strongly anisotropic elliptic problems*, to appear in SIAM-MMS.

[2] P. Degond, F. Deluzet, J. Narski, C. Negulescu, *An asymptotic Preserving scheme for a strong oblique anisotropy*, (in preparation).