A decomposition of the electromagnetic field. Application to the Darwin model

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Abstract. In many cases, the numerical resolution of Maxwell's equations is very expensive in terms of the computational cost. The Darwin model, an approximation of Maxwell's equations obtained by neglecting the divergence free part of the displacement current, can be used to compute the solution more economically. However, this models requires the electric field to be decomposed into two parts for which no straightforward boundary conditions can be derived. In this paper, we consider the case of a computational domain which is not simply connected. With the help of a functional framework, a decomposition of the fields is derived. It is then used to characterize mathematically the solutions of the Darwin model on such a domain.

Keywords. Darwin model, Helmholtz decomposition, non simply connected domains.

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