



## **Field-Line Resonances in the Current Basis**

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The MHD theory of the field-line resonance is of great importance for the understanding of ultra low-frequency waves in the magnetosphere. Most theoretical works concerning field-line resonance use the electric field as the basis set. In an ideal MHD plasma the field-aligned component of the electrical field vanishes because of the frozen-in theorem. However, a field-aligned current flows to maintain quasi-neutrality. This field-aligned current can only be carried by the transverse MHD Alfvén wave and is therefore a characteristic feature of these types of waves.

In this study we investigate the field-line resonance phenomenon using a three dimensional current vector space as the basis set. Using the model of the box magnetosphere of Southwood (1974) we derive an equation for the field-aligned current. This equation provides a simpler and more detailed insight into the coupling process between the fast mode and the Alfvén mode.

Furthermore we investigate the effect of the Hall current on the field-aligned current by including the Hall term in Ohm's law. It is shown that in some situations the Hall current can nullify the field-aligned current and therefore prevent the resonance.