sc00aa

The covariant components of the tangential magnetic field are related to the singular currents at the interfaces.

[called by: xspech.] [calls: coords.]

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1.1 covariant representation

1. The components of the vector potential, $\mathbf{A} = A_{\theta} \nabla + A_{\zeta} \nabla \zeta$, are

$$A_{\theta}(s,\theta,\zeta) = \sum_{i,l} A_{\theta,e,i,l} \, \overline{T}_{l,i}(s) \cos \alpha_i + \sum_{i,l} A_{\theta,o,i,l} \, \overline{T}_{l,i}(s) \sin \alpha_i, \tag{1}$$

$$A_{\zeta}(s,\theta,\zeta) = \sum_{i,l} A_{\zeta,e,i,l} \, \overline{T}_{l,i}(s) \cos \alpha_i + \sum_{i,l} A_{\zeta,o,i,l} \, \overline{T}_{l,i}(s) \sin \alpha_i, \tag{2}$$

where $\overline{T}_{l,i}(s) \equiv \overline{s}^{m_i/2} T_l(s)$, $T_l(s)$ is the Chebyshev polynomial, and $\alpha_j \equiv m_j \theta - n_j \zeta$. The regularity factor, $\overline{s}^{m_i/2}$, where $\overline{s} \equiv (1+s)/2$, is only included if there is a coordinate singularity in the domain (i.e. only in the innermost volume, and only in cylindrical and toroidal geometry.)

2. The magnetic field, $\sqrt{g} \mathbf{B} = \sqrt{g} B^s \mathbf{e}_s + \sqrt{g} B^\theta \mathbf{e}_\theta + \sqrt{g} B^\zeta \mathbf{e}_\zeta$, is

3. The covariant representation for the field is $\mathbf{B} = B_s \nabla s + B_\theta \nabla \theta + B_\zeta \nabla \zeta$, where

$$B_{s} = B^{s}g_{ss} + B^{\theta}g_{s\theta} + B^{\zeta}g_{s\zeta}$$

$$B_{\theta} = B^{s}g_{s\theta} + B^{\theta}g_{\theta\theta} + B^{\zeta}g_{\theta\zeta}$$

$$B_{\zeta} = B^{s}g_{s\zeta} + B^{\theta}g_{\theta\zeta} + B^{\zeta}g_{\zeta\zeta}$$

where $g_{\alpha\beta}$ are the metric elements (computed by coords).

4. On the interfaces, $B^s = 0$ by construction.

1.2 output data

1. The Fourier harmonics of the even-and-odd, covariant components of the magnetic field, B_s , B_θ and B_ζ , are saved in

Btemn(1:mn,0:1,1:Mvol),
Bzemn(1:mn,0:1,1:Mvol),
Btomn(1:mn,0:1,1:Mvol),
Bzomn(1:mn,0:1,1:Mvol);

and these are written to ext.sp.h5 by hdfint.

sc00aa.h last modified on ; SPEC subroutines;