Principles of Magnetohydrodynamics, by Hans Goedbloed and Stefaan Poedts (Cambridge University Press, 2004)

Errata, 1 February 2012

– *Back cover, last line:*

Zoran Mikie $\Rightarrow$ Zoran Mikić

– *p. xv, line 12 from below:*

Dan D'Ipolito $\Rightarrow$ Dan D'Ippolito

– *p. 4, last line:*

is $\mathrm{D_2O}$. $\Rightarrow$ contains a deuteron and a proton instead of two protons.

– *p. 12, lines 3 and 2 from below:*

10^8 $\Rightarrow$ 10^6,

minutes $\Rightarrow$ seconds

– *p. 32, line 8 from above:*

similar equation above $\Rightarrow$ similar equation to that above

– *p. 32, line16 from above:*

smaller $\Rightarrow$ larger

– *p. 35 and 36:*

Insert "$\mathrm{sgn}(q)$" before "$(\dot{y}_0/\Omega)$" in Eq. (2.6)(a), before "$(\dot{x}_0/\Omega)$" in Eq. (2.6)(b), before the same terms in 2nd line above Eq. (2.7), and before "R" in Eq. (2.9)(b).

– *p. 39, Eq. (2.16):*

e^i $\Rightarrow$ e^{i} (twice)

– *p. 41, Eq. (2.25):*

$|q|$ $\Rightarrow$ q

– *p. 41, line below Eq. (2.27):*

q $\Rightarrow$ $|q|$

– *p. 53, lines 1 and 5 from above:*

off-diagional $\Rightarrow$ traceless,

diagonal and off-diagonal $\Rightarrow$ isotropic and anisotropic

– *p. 55, lines 1 and 2 below Eq. (2.68):*

$n_{e,i}(\mathbf{r}, \mathbf{v}, t)$, $\mathbf{u}_{e,i}(\mathbf{r}, \mathbf{v}, t)$ $\Rightarrow$ $n_{e,i}(\mathbf{r}, t)$, $\mathbf{u}_{e,i}(\mathbf{r}, t)$

– *p. 58, line 5 from above:*

(2.82) $\Rightarrow$ (2.81)

– *p. 62, Eq. (2.99):*

$dt \;\Rightarrow\; d\omega$

– *p. 66, line 2 from above:*

(3.51) $\Rightarrow$ (3.53)

– *p. 67, lines 2 and 3 from above:*

dimension of $\Rightarrow$ dimension a of

– *p. 77, lines 2 and 5 below Eq. (2.159):*

$\mathbf{v}_1 \;\Rightarrow\; \boldsymbol{\xi}$ (the displacement corresponding to $\mathbf{v}_1 = \partial\boldsymbol{\xi}/\partial t = -\mathrm{i}\omega\boldsymbol{\xi}$)

– *p. 78, line above Fig. 2.12:*

Drop "inverse of the"

– *p. 98, line 7 from above:*

$v_A/L \;\Rightarrow\; L/v_A$

– *p. 101, after Eq. (3.71) add:*

(**NB:** The appearance of the Boltzmann constant in these equations implies that our transport coefficients may differ a factor k from those exploited by other authors.)

– *p. 110, line 5 from below:*

factors i $\Rightarrow$ factors i

– *p. 112, 1st line after Eq. (3.117):*

$\omega_e \;\Rightarrow\; \omega_{pe}$

– *p. 124, Eq. (3.154):*

$1-\gamma \;\Rightarrow\; \gamma-1$

– *p. 126, Eq. (3.166):*

$1-\gamma \;\Rightarrow\; \gamma-1$

– *p. 144, 2nd line of Eq. (4.42):*

$\times \stackrel{\rm (A.18)}{=} \oint \mathbf{v}\mathbf{B}_{\rm tor}\cdot d\boldsymbol{l}_{\rm pol} = 0 \;\;\Rightarrow\;\; \stackrel{\rm (A.18)}{=} \oint \mathbf{v}\times\mathbf{B}_{\rm tor}\cdot d\boldsymbol{l}_{\rm pol} = 0$

– *p. 158, Fig. 4.8(b):*

The black rectangles should not appear.

– *p. 160, Eq. (4.119):*

There should be no comma after the second line.

– p. 162, line 10 from below:

$\nabla \cdot \mathbf{B} = \mathbf{0} \;\Rightarrow\; \nabla \cdot \mathbf{B} = 0$

– p. 167, line 2 from below:

After “the slopes of the characteristics” add: “(dt/dx)”.

– p. 168, Fig. 4.12(b) and text in lines 8–6 from below:

The characteristics labeled $-c_1$ should have the label c_1 and go to the right (steeper than the characteristics c_2). The corresponding text should read:

“In the x–t plane, this front is located at the position where the forward characteristics (c_2) of the shocked part meet the forward characteristics (c_1) of the unshocked part (Fig. 4.12(b); also see LeVeque [243], p. 29).”

– p. 182, line 10 from below:

There should be a comma after “external circuits”.

– p. 197, 3rd line of Eq. (5.48):

$\mathcal{H} + (p \quad\Rightarrow\quad (\mathcal{H} + p$

– p. 197, 2nd line above Eq. (5.49):

Eq. (4.62)(d) $\Rightarrow$ Eq. (5.48)(d)

– p. 199, line 5 from above:

four factors $\Rightarrow$ three factors

– p. 200, line 10 from above:

Fig. 2.7 $\Rightarrow$ Fig. 2.9

– p. 208, 4th line from below:

the waves behave $\Rightarrow$ the slow waves behave

– p. 221, below Eq. (5.110):

Drop “space part of the”.

– p. 239, line 7 below Fig. (6.6):

$\mathbf{F}(\boldsymbol{\xi}) \quad\Rightarrow\quad \mathbf{F}(\hat{\boldsymbol{\xi}})$ (twice)

– p. 244, line 6 from below:

p and B $\Rightarrow$ p and $\mathbf{B}$

– p. 251, line 17 from below:

$n\pi \sin(n\pi x) \quad\Rightarrow\quad n\pi \cos(n\pi x)$

– p. 258, 2nd line above and 1st line of Eq. (6.85):

identifying $\boldsymbol{\xi}$ and $\boldsymbol{\eta}$, $\Rightarrow$ identifying $\boldsymbol{\eta}$ and $\boldsymbol{\xi}^*$,

$(\boldsymbol{\xi}^* \cdot \nabla p)\nabla \cdot \boldsymbol{\xi} + \mathbf{j} \cdot \boldsymbol{\xi}^* \mathbf{Q} \quad\Rightarrow\quad (\boldsymbol{\xi} \cdot \nabla p)\nabla \cdot \boldsymbol{\xi}^* + \mathbf{j} \cdot \boldsymbol{\xi}^* \times \mathbf{Q}$

– p. 260, 1st unnumbered equation:

$\hat{\boldsymbol{\xi}}^*\hat{\boldsymbol{\xi}} \;\Rightarrow\; \hat{\boldsymbol{\xi}}^* \cdot \hat{\boldsymbol{\xi}}$

– p. 263, 3rd line from below:

$\omega^2 \;\Rightarrow\; \omega$

– p. 273, expressions (6.119) and (6.121) should read:

$$
\begin{aligned}
W^f &= \tfrac{1}{2}\int \Big[\gamma p\,|\nabla\cdot\boldsymbol{\xi}|^2 + (\boldsymbol{\xi}\cdot\nabla p)\nabla\cdot\boldsymbol{\xi}^* - (\boldsymbol{\xi}^*\cdot\nabla\Phi)\,\nabla\cdot(\rho\boldsymbol{\xi})\Big]\,dV \\
&= \tfrac{1}{2}\int \Big[\gamma p\,|\nabla\cdot\boldsymbol{\xi}|^2 + \rho\mathbf{g}\cdot(\boldsymbol{\xi}\,\nabla\cdot\boldsymbol{\xi}^* + \boldsymbol{\xi}^*\nabla\cdot\boldsymbol{\xi}) + \mathbf{g}\cdot\boldsymbol{\xi}^*(\nabla\rho)\cdot\boldsymbol{\xi}\Big]\,dV. \\
W^f &= \tfrac{1}{2}\int \Big[\gamma p\,|\nabla\cdot\boldsymbol{\xi}|^2 - \rho g(\xi_x\nabla\cdot\boldsymbol{\xi}^* + \xi_x^*\nabla\cdot\boldsymbol{\xi}) - \rho' g|\xi_x|^2\Big]\,dV\,.
\end{aligned}
$$

– p. 283, 2nd line above and 1st line of Eq. (6.157):

identifying $\boldsymbol{\xi}$ and $\boldsymbol{\eta}$, and $\hat{\mathbf{Q}}$ and $\hat{\mathbf{R}}$, $\;\Rightarrow\;$ identifying $\boldsymbol{\eta}$ and $\boldsymbol{\xi}^*$, and $\hat{\mathbf{R}}$ and $\hat{\mathbf{Q}}^*$,

$(\boldsymbol{\xi}^*\cdot\nabla p)\,\nabla\cdot\boldsymbol{\xi} \;\Rightarrow\; (\boldsymbol{\xi}\cdot\nabla p)\,\nabla\cdot\boldsymbol{\xi}^*$

– p. 286, 2nd line of Eq. (6.172):

$(\nabla\times\mathbf{B})\mathbf{Q} \;\Rightarrow\; (\nabla\times\mathbf{B})\times\mathbf{Q}$

– p. 315, Eq. (7.50):

$g \;\Rightarrow\; g^2$

– p. 321, in Fig. 7.6:

$e^{i\omega t} \;\Rightarrow\; \mathrm{e}^{\mathrm{i}\omega t}$

– p. 331, 3rd line of Eq. (7.88):

$\rho\omega^2\xi_z \;\Rightarrow\; -\rho\omega^2\xi_z$

– p. 366, 1st and 2nd line of unnumbered equation:

$(\boldsymbol{\xi}^*\cdot\nabla p)\nabla\cdot\boldsymbol{\xi} + \mathbf{j}\cdot\boldsymbol{\xi}^*\mathbf{Q} \;\Rightarrow\; (\boldsymbol{\xi}\cdot\nabla p)\nabla\cdot\boldsymbol{\xi}^* + \mathbf{j}\cdot\boldsymbol{\xi}^*\times\mathbf{Q}$

– p. 370, line 6 from below:

$N/D < 0 \;\Rightarrow\; N/D > 0$

– p. 396, caption Fig. 8.5:

Sacrament. Peak $\Rightarrow$ Sacramento Peak

– p. 403, caption Fig. 8.11:

Erupting prominence. $\Rightarrow$ Erupting prominence as seen from the NASA Skylab Space Station on 10 December 1973.

– p. 423, line 14 from below:

(8.20) $\Rightarrow$ (8.33)

– p. 432, Fig. 9.1:

$\mu^{-1} \;\Rightarrow\; 2\pi/\mu\,;$

the black spot close to θ should not be there.

– p. 438, replace Eq. (9.24) by:

$$\begin{aligned}\nabla \;&=\; \mathbf{e}_r\,\partial_r + \mathbf{e}_\perp[(B_z/(rB))\partial_\theta - (B_\theta/B)\partial_z] + \mathbf{e}_\parallel[(B_\theta/(rB))\partial_\theta + (B_z/B)\partial_z]\,,\\ &=\; \mathbf{e}_r\,\partial_r + \mathrm{i}\mathbf{e}_\perp\,g + \mathrm{i}\mathbf{e}_\parallel\,f \quad (+\text{ possible terms from } \partial_\theta\mathbf{e}_r \text{ and } \partial_\theta\mathbf{e}_\theta)\,,\end{aligned}$$

– p. 506, line 16 from below:

There should be a comma after $\{\pm\omega_S\}$.

– p. 516, below Eq. (10.74):

$\omega_{A2}^2 H(x_0 - x) \;\Rightarrow\; \omega_{A2}^2 H(x - x_0)$

– p. 519, on third line of Eq. (10.81):

$+K_1(k_0\zeta_2) \;\;\Rightarrow\;\; -K_1(k_0\zeta_2)$

– p. 526, below Eq. (10.94) and above Eq. (10.97):

$\omega^2/b_e \;\Rightarrow\; \omega^2/b_e^2$

– p. 535, 1st and 2nd line below Eq. (11.1):

$\omega = \omega_d - \mathrm{i}\delta \;\Rightarrow\; \omega = \omega_d + \mathrm{i}\nu$

δ a small positive constant ($0 \le \delta \ll \omega_d$) that will be discussed below. $\Rightarrow$
ν a small positive constant ($0 \le \nu \ll \omega_d$) to guarantee causality (Section 11.1.2).

– p. 541, line 11 from below:

assume $\delta = 0 \;\Rightarrow\;$ assume $\nu = 0$

– p. 541, lines 8 and 7 from below:

$\omega = \omega_d + \mathrm{i}\delta$ with $\delta = 0^+$. The role of the ‘artificial’ damping ([235], [185]) is ...

$$\Downarrow$$

$\omega = \omega_d + \mathrm{i}\nu$ with $\nu = 0^+$. As stated in Section 11.1.1, this guarantees causality since the response of the wave amplitude (11.1) to the external driver vanishes as $t \to -\infty$ (see also Clemmov and Dougherty [58], p. 32).

In the solution of the initial value problem for plasma oscillations by means of the Laplace transform, the corresponding *Ansatz* is the Landau prescription for the integration contour in the complex ω-plane to be taken parallel to the real axis with a small positive imaginary part (Fig. 2.7(a)). To determine the asymptotic behaviour for $t \to \infty$, this contour is to be deformed into the lower half of the ω-plane around the branch points and zeros of the dispersion equation. This yields damped solutions. All this is not specific for the kinetic description but carries over to MHD waves, as outlined in Sections 6.3.2 (Fig. 6.11), 10.3 and 10.4.

An alternative way of treating the Alfvén singularity in the driven system is to consider a complex $\omega = \omega_d - \mathrm{i}\delta$ with ‘artificial’ damping coefficient $\delta > 0$ (Appert *et al.*, *Nuclear Fusion* **22** (1982), 903). The role of this ‘artificial’ damping is ...

– p. 542, line 4 above Fig. 11.2 and caption of that figure:

$\delta = -0.001 \;\Rightarrow\; \delta = 0.001$

– p. 542, Fig. 11.2:

The labels ${}_x\xi$ and ${}_y\xi$ in the left frames should appear as ξ_x and ξ_y inside the brackets of $\mathrm{Im}(\;)$ in the right frames. Moreover, Re and Im should be interchanged in the bottom part of the figure: $\mathrm{Re}(\xi_y) \;\Rightarrow\; \mathrm{Im}(\xi_y)\,, \quad \mathrm{Im}(\xi_y) \;\Rightarrow\; -\mathrm{Re}(\xi_y)\,.$

– p. 543, 5th line from below and last line:

Poynting vector $\mathbf{S} = \frac{1}{2}\,\mathbf{E}^* \times \mathbf{Q}$
$\Rightarrow$ time average $\bar{\mathbf{S}} = \mathrm{Re}(\frac{1}{2}\,\mathbf{E}^* \times \mathbf{Q})$ of the Poynting vector

$\mathrm{Re}[\mathbf{S}(x_2) - \mathbf{S}(x_1)] \;\Rightarrow\; [\bar{\mathbf{S}}(x_2) - \bar{\mathbf{S}}(x_1)]$

– p. 549, Eq. (11.48), spacing of the matrix elements should be:

$$\begin{pmatrix} \cdots \dfrac{d^2}{dx^2} & \dfrac{d}{dx} k_\perp B^2 \\ -k_\perp B^2 \dfrac{d}{dx} & \rho\omega^2 \cdots \end{pmatrix}$$

– p. 551, Eq. (11.55) should read:

$$+\frac{1}{2}\int_{\hat{V}} \nabla\cdot(\hat{\mathbf{E}}^* \times \hat{\mathbf{Q}})\,\mathbf{d\hat{V}} = \underbrace{-\frac{1}{2}\int_{\hat{V}} \hat{\mathbf{j}}_c^\star \cdot \hat{\mathbf{E}}^*\,d\hat{V}}_{\mathbf{P}_{\mathrm{ant}}} \underbrace{-\,\frac{1}{2}\int_{\hat{V}} \hat{\mathbf{Q}}\cdot\frac{\partial\hat{\mathbf{Q}}^*}{\partial t}\,d\hat{V}}_{\dot{\mathbf{W}}_{\mathbf{v}}}\,,$$

– p. 563, Fig. 11.12:

Upper frame: missing lines in the y-direction to be drawn as in Fig. 11.11(b). Lower frame: missing x- and ω_A-axes to be drawn.

– p. 580, last line:

p. 461 $\Rightarrow$ p. 481

– p. 604, 2nd line Ref. [230]:

1159–1170 $\Rightarrow$ 605–652

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