High-order h -adaptive discontinuous Galerkin methods for ocean modelling

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This erratum concerns the appendix of the paper *High-order h -adaptive discontinuous Galerkin methods for ocean modeling*, Ocean Dynamics, 57, 109–121.

Although presented only for completeness and not being used in our computations the analytical stream function Ψ of the Stommel gyre test case given in the appendix on page 120 is wrong. The non dimensional function $\mathcal{D}^3$ should read $\mathcal{D}$ while the velocity and water

elevation remain unchanged. The analytical Stommel gyre solution then reads :

$$\begin{aligned}\Psi(x, y) &= \frac{\mathcal{D}\tau_0 L_y}{\pi^2 \gamma \rho} f_1(x) \cos(\pi y) \\ U(x, y) &= \frac{\mathcal{D}\tau_0}{\pi \gamma \rho} f_1(x) \sin(\pi y) \\ V(x, y) &= \frac{\mathcal{D}\tau_0}{\pi \gamma \rho \delta} f_2(x) \cos(\pi y) \\ \eta(x, y) &= \frac{\mathcal{D}\tau_0 f_0 L_x}{\pi \gamma \rho \delta g h} \left[-\frac{\gamma}{f_0 \delta \pi} f_2(x) \sin(\pi y) \right. \\ &\quad \left. + \frac{1}{\pi} f_1(x) \left(\cos(\pi y)(1 + \beta y) - \frac{\beta}{\pi} \sin(\pi y) \right) \right]\end{aligned}$$

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with the following functions:

$$\begin{aligned}f_1(x) &= \frac{\pi}{\mathcal{D}} \left(1 + \frac{(e^{z_2} - 1)e^{xz_1} + (1 - e^{z_1})e^{xz_2}}{e^{z_1} - e^{z_2}} \right) \\ f_2(x) &= \frac{1}{\mathcal{D}} \frac{(e^{z_2} - 1)z_1 e^{xz_1} + (1 - e^{z_1})z_2 e^{xz_2}}{e^{z_1} - e^{z_2}} \\ \mathcal{D} &= \frac{(e^{z_2} - 1)z_1 + (1 - e^{z_1})z_2}{e^{z_1} - e^{z_2}} \\ z_2^1 &= \frac{-1 \pm \sqrt{1 + (2\pi \delta \epsilon)^2}}{2\epsilon}\end{aligned}$$

and with x and y the non dimensional axis $x \in [0, 1]$ and $y \in [-0.5, 0.5]$. The dimensionless parameters used are

Fig. 1 Isolines of the stream function $\Psi(x, y)$ obtained for the Stommel model. Notice that Ψ is the stream function of the transport so the units read $m^3 s^{-1}$. The following standard parameters are used: $f_0 = 10^{-4} s^{-1}$, $\beta = 2 \cdot 10^{-11} m^{-1} s^{-1}$, $\tau_0 = 10^{-1} Nm^{-2}$, $\gamma = 10^{-6} s^{-1}$, $g = 10 ms^{-2}$, $h = 10^3 m$, $\rho = 10^3 kgm^{-3}$ and $L_x = L_y = 10^6 m$ the length of the domain along the x and y dimensions

the aspect ratio of the domain $\delta = \frac{L_x}{L_y}$ and $\epsilon = \frac{\gamma}{L_x \beta}$ the parameter defining the boundary layer width.

This correction on the stream function expression requires a modification of figure 5 on page 115. The corrected function is depicted in Fig. 1.

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