Dear editor,

During the proofreading process eq. (12) was wrapped to a unclear form. I propose to move the definition of the constant c to the text, in order to make the wrapping more clear. I understand that I need your approval for such a change, hence this letter.

Current:

Analytic solutions of the wind speed profile can be derived from Eq. (10) using a constant or a linearly increasing eddy viscosity similarly to Ekman (1905) and Ellison (1956), respectively, using the original equation including wind veer, Eq. (5). The constant and linear eddy viscosity solutions of the decoupled 'veerless' ABL model become

$$\begin{aligned} &\text{Constant } \nu_T: && S(\xi) = G\left[1 - \exp(-\xi)\right], \\ &\text{Linear } \nu_T = \kappa u_{*0} z: && S(\eta) = G\left[1 - cK_0(\eta)\right], \quad c = 2u_{*0}/(\kappa G) = -\left[\gamma_e + \tfrac{1}{2}\ln\left(z_0 f_{pg}/(\kappa u_{*0})\right)\right]^{-1}, \end{aligned} \tag{12}$$

with $\xi = z\sqrt{f_{pg}/\nu_T}$ and $\eta = 2\sqrt{z f_{pg}/(\kappa u_{*0})}$ as normalized heights, K_0 as the zero-order modified Bessel function of the second kind, u_{*0} as the friction velocity at the surface, and γ_e is the Euler–Mascheroni constant. The derivation of the constant ν_T solution in Eq. (12) is identical to the classical 'textbook' Ekman (1905) solution (e.g. Wyngaard, 2010), taking $i|f_c| \rightarrow f_{pg}$, which also indicates that $\sqrt{f_{pg}} = \Re\{\sqrt{i|f_c|}\} = \sqrt{|f_c|/2}$. Note that the friction velocity in the linear ν_T solutions with and without wind veer is solved from an implicit relation of u_{*0}/G, through the constant c derived both via $dS/dz = u_{0*}/(\kappa z)$ and $S = 0$ for $z \rightarrow z_0$. The latter is effectively a form of the geostrophic drag law, which generally arises when G is used as a boundary condition in wind profile forms which include the surface stress and z_0 (Kelly and Troen, 2016). The solution including veer is further discussed in van der Laan et al. (2020b), also based on Ellison (1956) and Krishna (1980).

Proposed change:

Analytic solutions of the wind speed profile can be derived from Eq. (10) using a constant or a linearly increasing eddy viscosity similarly to Ekman (1905) and Ellison (1956), respectively, using the original equation including wind veer, Eq. (5). The constant and linear eddy viscosity solutions of the decoupled 'veerless' ABL model become

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with $\xi = z\sqrt{f_{pg}/\nu_T}$ and $\eta = 2\sqrt{z f_{pg}/(\kappa u_{*0})}$ as normalized heights, K_0 as the zero-order modified Bessel function of the second kind, $c = 2u_{*0}/(\kappa G) = -\left[\gamma_e + \tfrac{1}{2}\ln\left(z_0 f_{pg}/(\kappa u_{*0})\right)\right]^{-1}$ as a constant, u_{*0} as the friction velocity at the surface, and γ_e is the Euler–Mascheroni constant. The derivation of the constant ν_T solution in Eq. (12) is identical to the classical 'textbook' Ekman (1905) solution (e.g. Wyngaard, 2010), taking $i|f_c| \rightarrow f_{pg}$, which also indicates that $\sqrt{f_{pg}} = \Re\{\sqrt{i|f_c|}\} = \sqrt{|f_c|/2}$. Note that the friction velocity in the linear ν_T solutions with and without wind veer is solved from an implicit relation of u_{*0}/G, through the constant c derived both via $dS/dz = u_{0*}/(\kappa z)$ and $S = 0$ for $z \rightarrow z_0$. The latter is effectively a form of the geostrophic drag law, which generally arises when G is used as a boundary condition in wind profile forms which include the

Best regards,
(Maarten) Paul van der Laan