



FIGURE 4.4: Comparison of (a) traditional definitions of grid-point position and grid-size in the vertical, and (b) analytically derived grid-point position and scale factors. For both grids here, the same w -point depth has been chosen but in (a) the t -points are set half way between w -points while in (b) they are defined from an analytical function : $z(k) = 5(i - 1/2)^3 - 45(i - 1/2)^2 + 140(i - 1/2) - 150$. Note the resulting difference between the value of the grid-size Δ_k and those of the scale factor e_k .

Note that the definition of the scale factors (*i.e.* as the analytical first derivative of the transformation that gives (λ, φ, z) as a function of (i, j, k)) is specific to the *NEMO* model [Marti et al. 1992]. As an example, e_{1t} is defined locally at a t -point, whereas many other models on a C grid choose to define such a scale factor as the distance between the U -points on each side of the t -point. Relying on an analytical transformation has two advantages : firstly, there is no ambiguity in the scale factors appearing in the discrete equations, since they are first introduced in the continuous equations ; secondly, analytical transformations encourage good practice by the definition of smoothly varying grids (rather than allowing the user to set arbitrary jumps in thickness between adjacent layers) [Tréguier et al. 1996]. An example of the effect of such a choice is shown in Fig. 4.4.

4.2.2 Choice of horizontal grid

The user has three options available in defining a horizontal grid, which involve the namelist variable *jphgr_mesh* of the *namcfg* namelist.

jphgr_mesh=0 The most general curvilinear orthogonal grids. The coordinates and