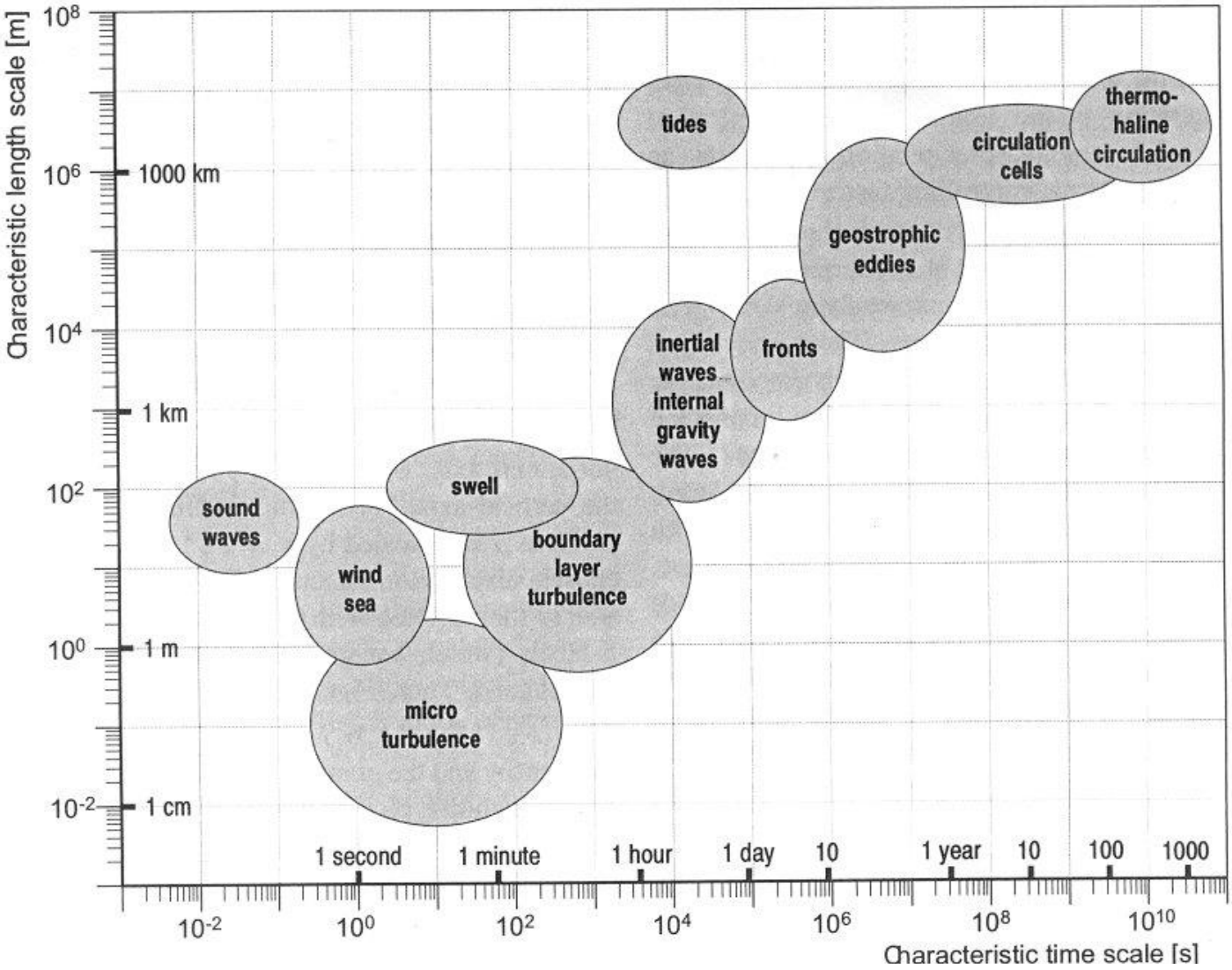
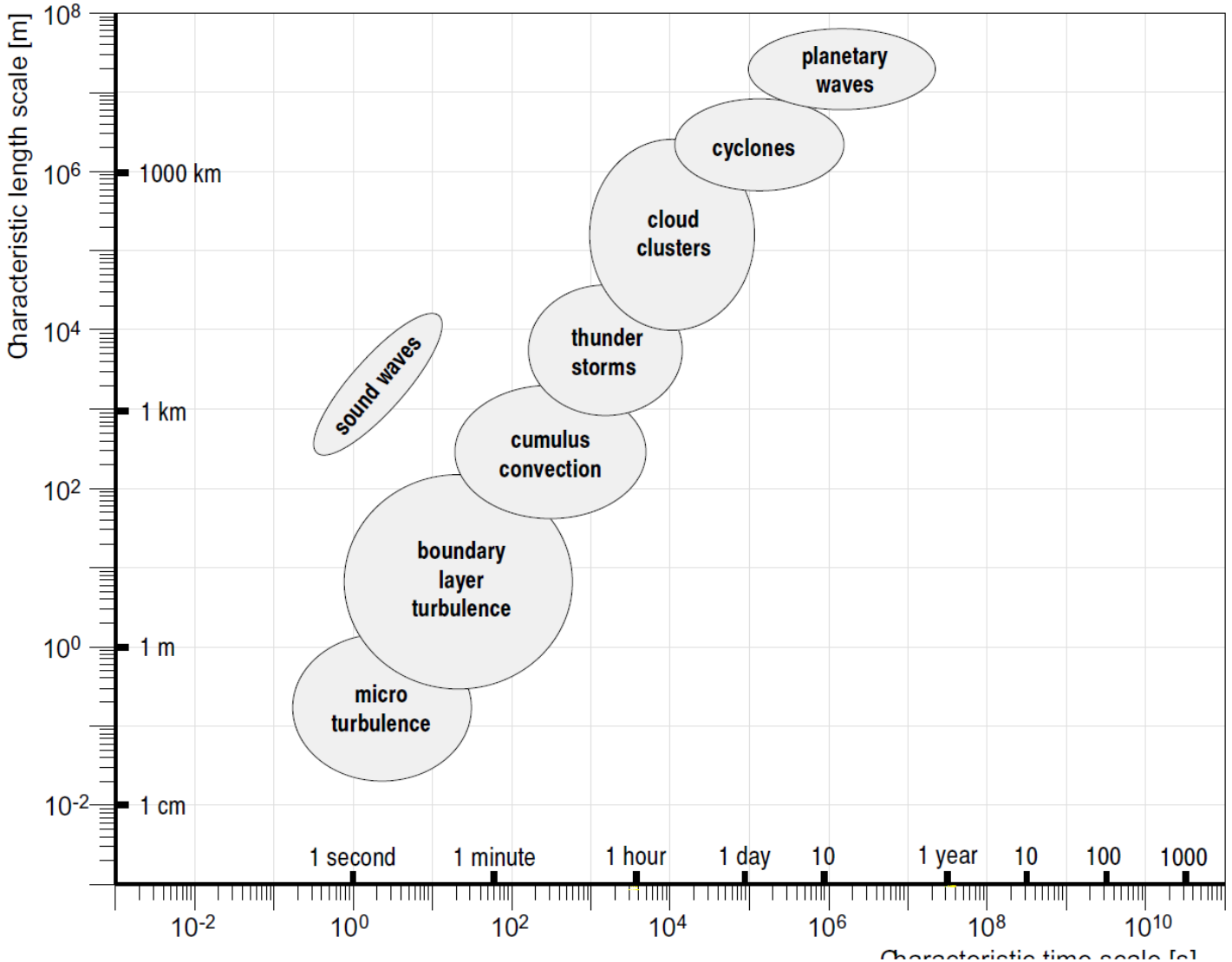
Spatial and temporal scales in the ocean



(source: von Storch and Zwiers, 1999)

Spatial and temporal scales in the atmosphere



(source: von Storch and Zwiers, 1999)

Scaling of synoptic (mesoscale) motions in the atmosphere (ocean)

Table 2.1 *Scale Analysis of the Horizontal Momentum Equations*

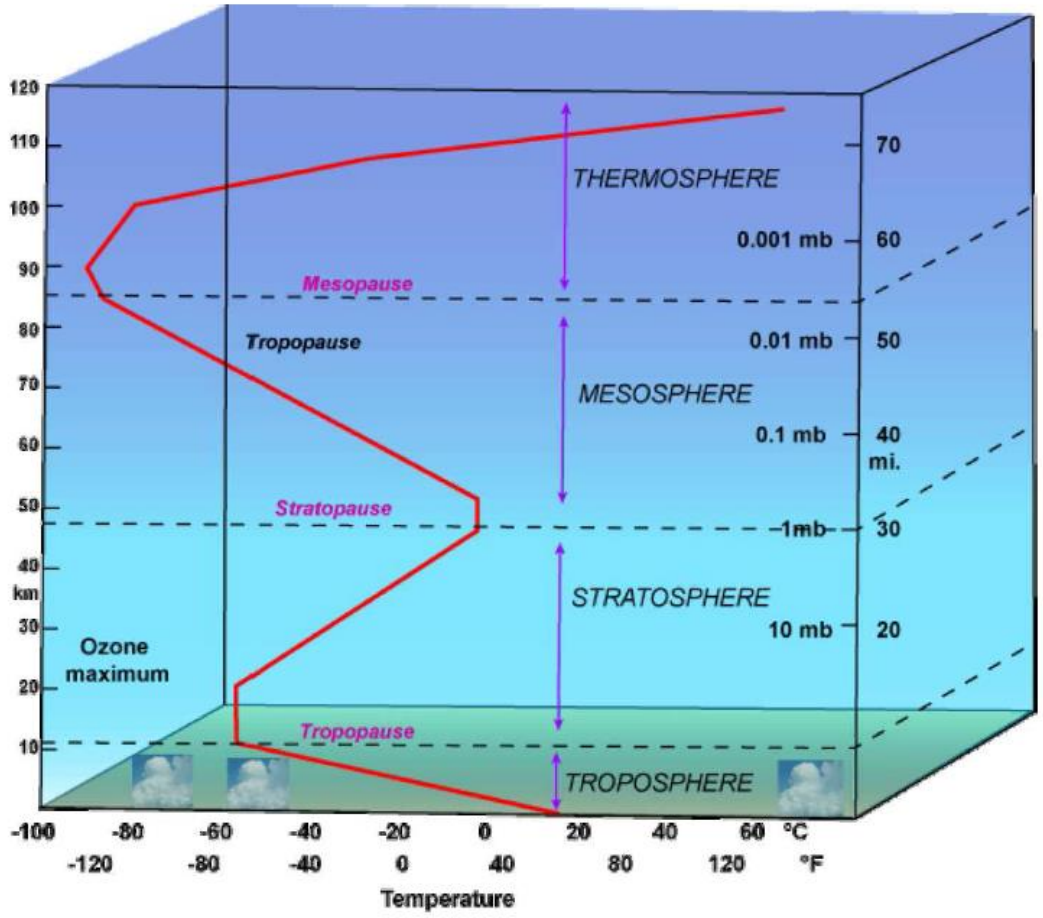
	A	B	C	D	E	F
$x-$ Eq.	$\frac{Du}{Dt}$	$-2\Omega v \sin\phi$	$+2\Omega w \cos\phi$	$+\frac{uw}{a}$	$-\frac{uv\tan\phi}{a}$	$=-\frac{1}{\rho}\frac{\partial p}{\partial x}$
$y-$ Eq.	$\frac{Dv}{Dt}$	$+2\Omega u \sin\phi$		$+\frac{vw}{a}$	$+\frac{u^2\tan\phi}{a}$	$=-\frac{1}{\rho}\frac{\partial p}{\partial y}$
Scales	U^2/L	$f_0 U$	$f_0 W$	$\frac{UW}{a}$	$\frac{U^2}{a}$	$\frac{\delta P}{\rho L}$
(m s^{-2})	10^{-4}	10^{-3}	10^{-6}	10^{-8}	10^{-5}	10^{-3}

Table 2.2 *Scale Analysis of the Vertical Momentum Equation*

z - Eq.	Dw/Dt	$-2\Omega u\cos\phi$	$-(u^2+v^2)/a$	$=-\rho^{-1}\partial p/\partial z$	$-g$
Scales	UW/L	$f_0 U$	U^2/a	$P_0/(\rho H)$	g
m s^{-2}	10^{-7}	10^{-3}	10^{-5}	10	10

Source: Holton (2004)

Sketch of the temperature profile of the whole atmosphere



(Source: D. Dommenget)

Why does the warmer surface air does not raise above the colder air in higher levels?