Wind and vorticity vectors

Wind is the speed of the air relative to the ground. It can be represented as a 3-dimensional "*Vector*" according to the 3 reference directions: west-to-east, south-to-north, nadir-to-zenith. *Vorticity*" characterizes the rotational movements of air. It is also a vector whose components according to these 3 directions are proportional to the variations of the transverse components of the wind in perpendicular directions. Thus, purely horizontal vortices have a purely vertical vorticity (Figure 1a). A vertical circulation (Figure 1b) around a horizontal axis, a vertical variation (also called "*Vertical Shear*") of the horizontal wind (U_Z, V_Z) (Figure 1c), or a horizontal variation of the vertical wind (Figure 1d) produce horizontal vorticity.

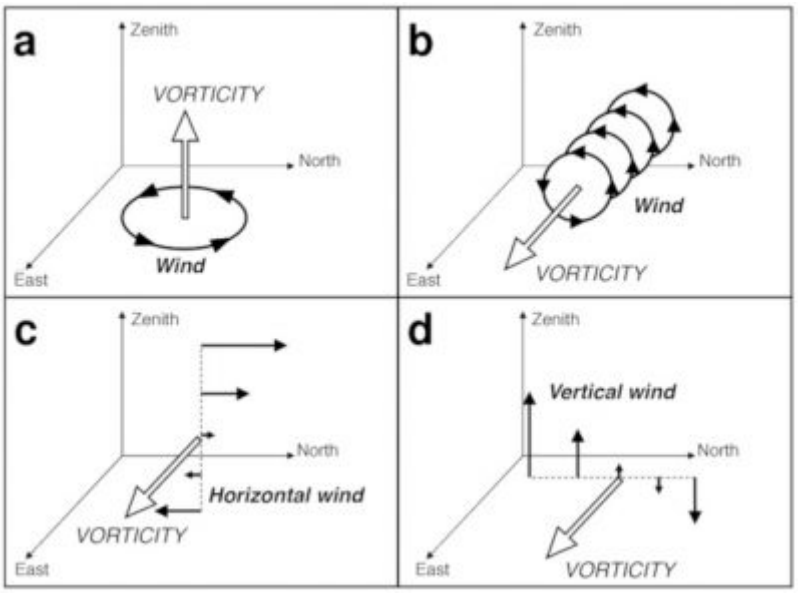

Figure 1. Relationship between wind variations and vorticity: (a) horizontal vortex circulation and vertical vorticity, (b) vertical vortex circulation and horizontal vorticity, (c) vertical variation of horizontal wind and horizontal vorticity, (d) horizontal variation of vertical wind and horizontal vorticity.

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