11. Coriolis force

10. January 2024

Problem 1.
Check the validity of the phrase "apple doesn't fall far from the tree"for an apple tree at the equator after considering the Coriolis force. Consider that the apple falls from the height $h = 4$ m. Neglect the air resistance as well as the effect of the horizontal velocity caused by the Coriolis force.

Problem 2.
Look at a particle moving from west to east on the northern hemisphere, that was dislocated to a more poleward position by some external perturbation. What will happen then, if we consider the effect of the Coriolis force in the form $\mathbf{F} = (fv, -fu, 0)$, where $f = 2\Omega \sin\varphi$ for the latitude φ? Consider barotropic (density is a function of pressure), horizontal and non-divergent flow, for which the vorticity equation takes the form $\mathrm{d}(\zeta + f)/\,\mathrm{d}t = 0$, where ζ is the relative vorticity.