|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Word | Symbol | units | Math | Relevant sketch or words |
| Latitude | (a scalar coordinate varying only in one spatial direction)  N/S direction | Degrees  Or  (Radians) | Latitude is an angle from the center of the Earth to N/S direction. That's why we take its sine and cosine. |  |
| Longitude | Θ  (a scalar coordinate varying only in one spatial direction)  E/W direction | Degrees  Or  (Radians) | Latitude is an angle from the center of the Earth to E/W direction. That's why we take its sine and cosine. |  |
| Altitude | *z* | Km | Hight in Atmos from  MSL (Mean Sea Level)  OR  AGL (Above Ground Level) |  |
| Zonal | *u* | m/s | The *horizontal velocity vector* **V** is given by  **V =** *u***i +** *v***j**  where **i** and **j** are the unit vectors in the zonal and meridional directions, respectively.  +ve & -ve zonal velocities  are referred to as *westerly* and *easterly* winds, respectively.  +ve & -ve meridional velocities are referred to as *southerly* and *northerly* winds (in both northern and southern hemispheres, respectively |  |
| meridional | *v* | m/s |  |
| Vertical  *(Omega)* |  | m/s | Winds in upward direction (Z direction)  3D  Updraft / downdraft  If |  |
| Scalar |  |  | A quantity that has magnitude but no particular direction  Ex: length, mass, speed, etc | Any mathematical operation carried out among two or more scalar quantities will provide a scalar only. However, if a scalar is operated with a vector then the result will be a vector |
| Vector | Bolded **V**  Or |  | A quantity that has magnitude and acts in a particular direction  Ex: [velocity](https://www.toppr.com/ask/question/why-is-velocity-a-vector-whereas-speed-is-a-scalar-quantity/), momentum, force, etc | The result of mathematical operations between two or more vectors may give either scalar or vector.  -> The dot product of two vectors gives only scalar; -> While, cross product, summation, or subtraction between two vectors results in a vector. |
| Word | Symbol | units | Math | Relevant sketch or words |
| Dot Product | = = ΑΒ cos θ  A. B = B. A | The resultant of the dot product of the vectors is a scalar quantity. | A dot product is the product of the magnitude of the vectors and the cos of the angle between them. |  |
| Cross Product | = ΑΒ sin θ  A × B ≠ B × A | The resultant of the cross product of the vectors is a vector quantity. | A cross product is the product of the magnitude of the vectors and the sine of the angle that they subtend on each other. |  |
| Divergence  *(Pure)* |  |  |  |  |
|  | | | | |
| Vorticity | *ζ* |  | *Ζ* |  |
|  | | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Word | Symbol | units | Math | Relevant sketch or words | | | | | |
| Sheering Deformation |  |  |  |  |
|  | | | | |
| Stretching Deformation |  |  |  |  |
|  | | | | |
| Pressure levels  (Contours) | P | Pa  Pa = =  = 1bar |  |  |
| Domain | F(x) |  | The set of all values for which the function is defined  (Input) |  |
| Range | F(Y) |  | The set of all values that f takes  (Output) |  |
| Curvature |  |  |  |  |
| Distance North from Origin |  |  |  |  |
| Temperature |  |  |  |  |
| Del Operator |  |  |  |  |
| Local or Eulerian tendency of T(X,Y,t) |  |  |  |  |
| Gradient of P(x,y) where P is pressure |  |  |  |  |
| Gradient of ∅(x,y,t) (∅ = gZ) |  |  |  |  |
| Laplacian of T(x,y,t) |  |  |  |  |
| Laplacian of p(x) |  |  |  |  |
| Speed of wind whose components are u(x,y), v(x,y) |  |  |  |  |
| Vector velocity of a baseball in x,y,z cordinates |  |  |  |  |
| Vector velocity field of pure divergence |  |  |  |  |
| Omega |  |  |  |  |
| Laplacian of Z(x,y) |  |  |  |  |
| Vector velocity |  |  |  |  |
|  |  |  |  |  |
| Flux of specific momentum (Velocity) |  |  |  |  |
| Energy Flux (e.g.van irradiance) |  |  |  |  |
| Vertical velocity |  |  |  |  |
| Mass Flux |  |  |  |  |
| Vertical component of vector velocity |  |  |  |  |
| **Circulation**, the path integral around a closed curve of the curve-tangential component of the flow |  |  |  |  |
| Circulation, what is it equal to (Stokes' theorem) |  |  |  |  |
| Explain letter you choose |  |  |  |  |
|  |  |  |  |  |
| Meridional flux of zonal momentum |  |  |  |  |
| Vertical advection of meridional momentum |  |  |  |  |
| Curl Operator |  |  |  |  |
| PGF |  |  |  |  |
| troposphere: the layer of air that radiation cools, so that surface solar heating must warm it with weather motion |  |  |  |  |
| Coriolis force (per unit mass) |  |  |  |  |
| Coriolis parameter |  |  |  |  |
| planetary vorticity |  |  |  |  |
| temperature anomaly |  |  |  |  |
| (name) Planetary boundary layer |  |  |  |  |
| horizontal advection of specific humidity q |  |  |  |  |
| horizontal convergence of horizontal flux of (moisture) q |  |  |  |  |
| local (Eulerian) tendency of q |  |  |  |  |
| total (Lagrangian) tendency of q |  |  |  |  |
| vertical shear of zonal wind |  |  |  |  |
| confluence without convergence |  |  |  |  |
| Mass of 1 cc = 1 ml of water in MKS |  |  |  |  |
| streamfunctio n 𝜓(𝑥, 𝑦) of a nondivergent 2D horizontal flow ( 𝑉 = 𝒌 × 𝛁𝜓) |  |  |  |  |
| |  | | --- | | wavelength | |  |  |  |  |
| amplitude |  |  |  |  |
| cause and effect |  |  |  |  |
| Shear |  |  |  |  |
| Splat with a twist |  |  |  |  |
| A flow field with curvature but not vorticity. Sketch it carefully as vectors at the indicated points. |  |  |  |  |
| Radius of earth in MKS units |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
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