Gmail

Srinivasan Kannan <ka.shreenivaasan@gmail.com>

divergence of pressure gradient

Srinivasan Kannan <ka.shrinivaasan@gmail.com> Mon, Mar 17, 2025 at 3:49 PM
To: Srinivasan Kannan <ka.shreenivaasan@gmail.com>

The "divergence of pressure gradient" refers to **the rate at which a fluid's pressure gradient changes**, which can indicate whether fluid is converging or diverging at a point. A positive divergence means fluid is spreading outward, while a negative divergence (convergence) means fluid is flowing inward. [1, 2, 3, 4]

Here's a more detailed explanation: [5, 6, 7]

- **Pressure Gradient:** In fluid dynamics, a pressure gradient is the rate of change of pressure over distance. It essentially describes how quickly the pressure is changing as you move from one point to another. [5, 6, 7]
- **Divergence:** In the context of fluid flow, divergence refers to the net flow of fluid out of a small volume or area. [2, 3, 4]
- **Divergence of Pressure Gradient:** The divergence of the pressure gradient measures how the pressure gradient itself is changing in space. A positive divergence means the pressure gradient is increasing (becoming more negative), while a negative divergence means the pressure gradient is decreasing (becoming less negative). [2, 3, 4]
- **Physical Significance:** [2, 4]
  - **Positive Divergence:** If the divergence of the pressure gradient is positive, it means that the pressure gradient is increasing, leading to a tendency for fluid to spread out or diverge from that point. [2, 4]
  - **Negative Divergence:** Conversely, a negative divergence of the pressure gradient means the pressure gradient is decreasing, leading to a tendency for fluid to converge or flow towards that point. [2, 4]

- **Examples:** [8]
  - **Weather:** In meteorology, divergence in the upper troposphere can lead to rising air and the formation of low-pressure systems (which can bring cloudy weather), while convergence can lead to sinking air and high-pressure systems (which can bring clear skies). [8]
  - **Fluid Flow:** In general, a positive divergence of pressure gradient can lead to the formation of a source or a region where fluid is flowing outwards, while a negative divergence can lead to the formation of a sink or a region where fluid is flowing inwards. [2, 4]

Generative AI is experimental.

[1] https://www.freedomgpt.com/wiki/pressure-gradients
[2] https://en.wikipedia.org/wiki/Divergence
[3] https://www.quora.com/Can-I-get-a-pressure-gradient-by-calculating-the-divergence-of-velocity
[4] https://math.gmu.edu/~dwalnut/teach/Math313/Fall10/Sec.9.8.pdf
[5] https://en.wikipedia.org/wiki/Pressure-gradient_force
[6] https://uw.pressbooks.pub/ocean285/chapter/the-pgf/
[7] https://www.sciencedirect.com/topics/engineering/pressure-gradient
[8] https://www.ess.uci.edu/~yu/class/ess124/Lecture.7.force.2019w.pdf