

Experimental study about formation of the circumpolar jet in the round domain on a rotating sphere

Hiroshi Gunji[1]; Satoshi Sakai[2]

[1] Department of Geophysics, Kyoto Univ; [2] Human and Environ. ,Kyoto Univ

<http://www-mete.kugi.kyoto-u.ac.jp/gunji/>

The planetary atmosphere and the planetary ocean show-like about 2-dimensional behavior on a big scale according to the effect of rotation or stratification. Bearing this in mind, research while 2-dimensional fluid movement on a rotation surface of a sphere is contrasted with the planet atmosphere, or the actual ocean and the actual atmosphere has been advanced. Yoden and Yamada (1993) performed the numerical computation of the attenuation nature turbulent flow in all surface-of-a-sphere domains, and when rotation was sufficiently quick, it showed that the circumpolar style was formed in high latitude. The numerical computation of an attenuation nature turbulent flow [in / in Taniguchi (2002) / the circular domain on a rotation surface of a sphere] – carrying out – all balls – the west wind for reverse – it was shown that a circumpolar vortex is formed. Since reappearance by indoor experiment is difficult for such research, most has been performed numerically. However, in numerical computation, since a calculation-on principle error cannot be escaped, it is necessary to support a result by indoor experiment. then, the west wind writers were indicated to be by Taniguchi (2002) – formation of a circumpolar vortex was reproduced and checked by laboratory experiment.

1. Reappearance Domain

In this research, the 2-dimensional nature of a flow was secured by carrying out high-speed rotation of the tank. if high-speed rotation of the tank is carried out – the water surface symmetrical with the axis of rotation – it is generated by displacement. this water surface – according to the orographic beta effect produced by displacement, at the end of a domain, it is made for the degree of planet whirlpool to become half [main], and the size was smaller than the hemisphere and the surface of a sphere whose boundary corresponds with a line south latitude 30 degrees was reproduced.

2. Experimental Device

An experimental device consists of a foundation portion and a portion of the rotating rotation stand. The rotation stand which carried the tank made it link directly with the stepping motor fixed to the foundation. Moreover, the axis-of-rotation receptacle was attached also in the rotation stand upper part. By this rotation mechanism, rotational accuracy is very high. The flow applied sheet light to the styrene bead set adrift in work fluid from width, and visualized it by taking a photograph with the digital camcorder attached at the rotation stand upper part. Initial turbulence took out, inserted and generated the stick arranged in the shape of a lattice from on work fluid. % The tip of a stick was processed so that the depth whose stick is depressed might become anywhere fixed. The stick arranged in the shape of a lattice prepared two kinds, that whose interval of a lattice is 3cm, and a 6cm thing, changes the size of the whirlpool formed in early stages, and enabled it to experiment in it. In the experiment, the small-scale whirlpool was given in early stages, and time development was investigated. The experiment parameter considered as the size of the whirlpool given in early stages of the thickness of a lattice, and the flow velocity, and performed a total of 21 times and 84 trial for four sorts of trial with the combination of vortical size and the size of the flow velocity, respectively. . consequently, the west wind from the small-scale whirlpool given in early stages in all four sorts of conditions – it turned out that a circumpolar vortex is formed. In a lecture, results including the flow velocity place for which it asked in analysis are due to be introduced.