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Error Evaluation of Planetary Atmospheric Motion Vectors by Statistical Presumption Technique.

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In the Solar System there are the planets (e.g. Venus, Jupiter, Saturn, etc.) whose surface environment and general atmospheric circulation differs from Earth's one. If we can understand the meteorology of these planets, we get the imformation of meteorological mechanism which completely differs from the Earth' one. By returing this imformation to the Earth's meteorology we more deeply understand the meteorological phenomenon of the Earth than now. Therefore, it is important to research the meteorology of these planets.

In past meteorological researches of the atmospheric planets they had not reached to detailed understanding. This reason is that in many cases target phsical phenomenon is covered with the error because of data shortage. For soluving this problem we must obtain the many data.

However, examining the past research, I notice that the possibility of overestimate of error. Concretely, it is like below.

In past meteorological researches of the atmospheric planets except the Earth, in which the Atomospheric Motion Vectors (AMVs) are derived from their cloud images, the AMVs' accuracy is evaluated from the spatial and time adjustment. The AMVs which depart the permissible range are deleted, which is desided in view of the spatial and time scale of the target physical phenomenon and the possibility of miss-matching.

The error of AMVs is defined as the standard deviation of neighboring AMVs.

In this definition, however, the error of AMVs depend on the permissible range and is anticipated to be as large as the target physical phenomenon. In fact, there were some researches that they couldn't prove whether the target physical phenomenon existed because of the large error of itself.

The proper error evaluation as well as the observation method is important for proving the existence of the target physical phenomenon.

The purpose of this study is to establish the error evaluation of AMVs which reflects influence of the image spatial resolution and the change of cloud shape upon AMVs.

I think that the error of AMVs depends on the image spatial resolution and the change of cloud shape largely not on the spatial and time fluctuation of AMVs. By the change of cloud shape we can't track the cloud motion precisely. By the image spatial resolution the error of 1 pixel is attached to the AMVs.

In this study, by statistical presumption technique, which is called Fisher's Z-transformation and Bootstrap method, I evaluate the error of AMVs which reflects influence of the image spatial resolution and the change of cloud shape upon AMVs.

In order to verify this method, I make simple and fractal cloud patterns (the simple cloud pattern is a quadrangular, and the fractal cloud pattern simulates the Venus' cloud pattern.), and calculate the AMVs and the error with error evaluation by statistical presumption technique using these patterns. This result is that the error of AMVs by this method is almost equivalent to the expected error of the change of cloud shape, and rely on the change rate of cloud shape.

In addition, using Venus' cloud images I calculate the AMVs and the error with error evaluation by statistical presumption technique and the error with past error evaluation, which calculate the standard deviation of neighboring AMVs. The result is that the error by statistical presumption technique is smaller than the error of past.

In this study, by statistical presumption technique the error evaluation of AMVs that reflects influence of the image spatial resolution and the change of cloud shape upon AMVs is established. And the past researches need reexamining because of the possibility of overestimate of error.