Dataset of paper "Contribution of Diurnal Tide to Venus Cloud-Top Superrotation"

Table of Contents

Introduction

This dataset contained the Venus PCM simulated data with high resolution ($1.25^\circ \times 1.25^\circ$ in longitude $\times$ latitude) used in the paper "Contribution of Diurnal Tide to Venus Cloud-Top Superrotation".
The detail descriptions of this simulation can be found at our 2024 paper "Planetary-Scale Wave Activity in Venus Cloud Layer Simulated by the Venus PCM".
More data are available from the Dexin Lai or Sebastien Lebonnois upon reasonable request.

Dataset structure

The dataset is organized as follows (all in the same directory):

- **doc**: This file and "*readme.pdf*".
- **data**: NetCDF files end with "*.nc*".

- **browse**: HTML files end with "*.html*".

Data Description

Tamp.nc and *Tphase.nc*

> The amplitude and phase of diurnal and semidiurnal tidal components fitted using a least-squares harmonic fit in solar-fixed coordinate.
> Details of each variable are shown in *Tamp.html* and *Tphase.html*.

EPflux.nc

> The Eliassen-Palm flux $\mathbf{F} = \mathbf{F}_{AM} + \mathbf{F}_{heat}$ of total (fitted to zonal wavenumber 1-4), diurnal and semidiurnal tides and their corresponding contributed acceleration to zonal wind.
> Details of each variable are shown in *EPflux.html*.

AMflux.nc

> The angular momentum flux term $\mathbf{F}_{AM} = (0, -\rho_0 a \cos\phi \overline{u'v'}, -\rho_0 a \cos\phi \overline{u'w'})$ of total (fitted to zonal wavenumber 1-4), diurnal and semidiurnal tides and their corresponding contributed acceleration $\frac{\nabla \cdot \mathbf{F}_{AM}}{\rho_0 a \cos\phi}$ to zonal wind.
> Details of each variable are shown in *AMflux.html*.

heatflux.nc

> The angular momentum flux term $\mathbf{F}_{heat} = (0, \rho_0 a \cos\phi \frac{\partial \bar{u}}{\partial z} \frac{\overline{v'\theta'}}{\partial\bar{\theta}/\partial z}, \rho_0 a \cos\phi (f - \frac{1}{a\cos\phi}\frac{\partial \bar{u}\cos\phi}{\partial\phi}) \frac{\overline{v'\theta'}}{\partial\bar{\theta}/\partial z})$ of total (fitted to zonal wavenumber 1-4), diurnal and semidiurnal tides and their corresponding contributed acceleration $\frac{\nabla \cdot \mathbf{F}_{heat}}{\rho_0 a \cos\phi}$ to zonal wind.
> Details of each variable are shown in *heatflux.html*.

estimation.nc

> The estimated vertical EP flux of diurnal and semidiurnal tides and their corresponding contributed acceleration to zonal wind based on method of Horinouchi et al., 2020.
> For semidiurnal tide, assumed it as the gravity mode, then its vertical EP flux can be estimated as: $F_z \approx \zeta_a S^{-1} \overline{v'T'} \cos\phi$.
> For diurnal tide, assumed it as the Rossby mode, then its vertical EP flux can be estimated as: $F_z \approx c_{gz} \hat{c}^{-1} E$.
> Details of each variable are shown in *estimation.html*.

Usage

To use the data effectively, you may need to proceed with NetCDF files.
Example code for loading and exploring it:

```
import xarray as xr
# open dataset
dset = xr.open_dataset(Tamp.nc)
# show dataset
print(dset)
# show variable
dset["D1Tamp"].plot(yscale="log")
```

Contributors

The simulation is conducted by Dexin Lai and Sebastien Lebonnois.

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