**Data file 1**

Detection data for each site: AQ2\_S, AQ2\_W, CS2\_S. CS2\_W. GZ2\_S, GZ2\_W, NC2\_S, NC2\_W, WH2\_S, WH2\_W, YC2\_S, YC2\_W. W and S represent autumn and summer respectively.

sites: Yichang (YC), Wuhan (WH), Anqing (AQ), Changsha (CS), Nanchang (NC) and Ganzhou (GZ) in China.

elements: altitude (z), latitude (lat), longitude (lon), seconds after release (time). 1, 2, and 3 represent rising, flat-floating, and falling, respectively.

**Data file 2**

Calculated parameter files from the rising and flat-floating stages including six sites:

GWFL1\_W, GWFL1\_S.

elements:

IGW parameters: horizontal wavelength (lh1), kinetic energy (Ek), potential energy (Ep), zonal momentum flux (mfx1), meridional momentum flux (mfy1).

Turbulence parameters: turbulent kinetic energy dissipation rate (ԑ), and KHI (ratio of 0<Ri<0.25 from 18-25 km)

SGW parameters: Hurst index (H1) and intermittent parameter (C1)

**Data file 3**

Parameter files calculated from flat-floating data:

Parameter\_AQS, Parameter\_CSS, Parameter\_GZS, Parameter\_NCS, Parameter\_WHS, Parameter\_YCS, Parameter\_AQW, Parameter\_CSW, Parameter\_GZW, Parameter\_NCW, Parameter\_WHW, Parameter\_YCW.

elements: Hurst index (H1), intermittent parameter (C1), days from the first release (date, .5 represents the afternoon, starting on June 1 and October 13 respectively), mean flat-floating height (h)

**Data file 4**

Parameter files for the calculation premise of C1:

var\_AQS, var\_YCS, var\_CSS, var\_GZS, var\_NCS, var\_WHS, var\_YCW, var\_AQW, var\_WHW, var\_CSW, var\_GZW, var\_NCW.

elements: zonal (value is 1 means separation distance along the zonal direction, value is 2 means separation distance along the meridional direction), dgw (the scale of SGW corresponding to the parameter space), C3q (The distance between K(q) and 0 when q=1, and taking the case of less than 0.02 as approximately satisfying K(1)=0).

**Data file 5**

Parameter files for mean flat-floating height of all data:

Height\_S, Height\_S.

**Data file 6**

Parameter files from flat-floating stage for all data:

TOTAL\_float\_parameter\_S, TOTAL\_float\_parameter\_W

elements: C3q ((The distance between K(q) and 0 when q=1, and taking the case of less than 0.02 as approximately satisfying K(1)=0), intermittent parameter (C3), dgw (the scale of SGW corresponding to the parameter space), Hurst index (H1), mean flat-floating height (h), and GW state (state, 0 means stable GW, 1 means unstable GW, and 2 means GW + turbulence)