**Technometrics--Author Contributions Checklist Form**

Codes are divided into Simulation and application parts.

Possible **original** functions are bivmbd.R, sbd.R. trivariate\_sbd.R

Functions related with **mean\_based** method tests are: bivariate\_4group\_mean.R, trivariate\_4group\_mean.R, pairwise\_mean\_comparison.R

Functions related with **rank\_based** method tests are: rank\_based.R, trivariate\_rankbased.R

**Description (Mandatory)**

The code is readily available at:

https://github.com/ypsd/FMANOVA

**Optional Information (complete as necessary)**

## Simulation

Simulation are divided into joint and marginal parts.

There are 4 files in the marginal parts: Model1.R, Model2.R, Model3.R, Model4.R

There are also 4 corresponding files in the joint parts: ccf\_Model1.R, ccf\_Model2.R, ccf\_Model3.R, ccf\_Model4.R

## Data Application

1. **Saudi Arabia**

Data are from NOAA (National Oceanic and Atmospheric Administration) with the GFDL-ESM2M model based on historical wind speeds during 1976-2005.

**Data are available at:** uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19760101-19801231.nc

uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19810101-19851231.nc

uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19860101-19901231.nc

uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19910101-19951231.nc

uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19960101-20001231.nc

uas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_20010101-20051231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19760101-19801231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19810101-19851231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19860101-19901231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19910101-19951231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_19960101-20001231.nc

vas\_MNA-22\_NOAA-GFDL-GFDL-ESM2M\_historical\_r1i1p1\_SMHI-RCA4\_v1\_day\_20010101-20051231.nc

data file: normal\_coordinate.csv, image\_mean.csv, image\_median.csv, saudi\_index.csv

Code: Saudi\_preprocess.R, saudi\_model\_effect.R, saudi\_visualization.R

1. Canada weather

Data are available from R package

Code: Canadian weather 2.R

1. Spanish weather

Data are available from R package

Code: Spanish Weather 3-dimension.R