Estimation of turbulence triplet covarinaces for bora flows

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1. Introduction

- turbulent characteristics of bora → strong, cold and gusty wind that usually blows from the northeast quadrant on the east coast of the Adriatic Sea
- main objective → 30-minute averages of the third order moments (turbulence triplet covariances)
- triple moments → turbulent transport of energy
- main motivation → Babic et al, 2016
- vertical profiles of triple moments for the first time

2. Data and methods

- measuring tower on Pometeno brdo, near Split, Croatia
- period → April 2010 till June 2011
- u, v, w and Ts
- three heights → 10, 22 and 40 m
- 60 bora episodes were isolated → total duration of 2064 h with 4128 30-min intervals

2. Data and methods

Velocity variance budget equation

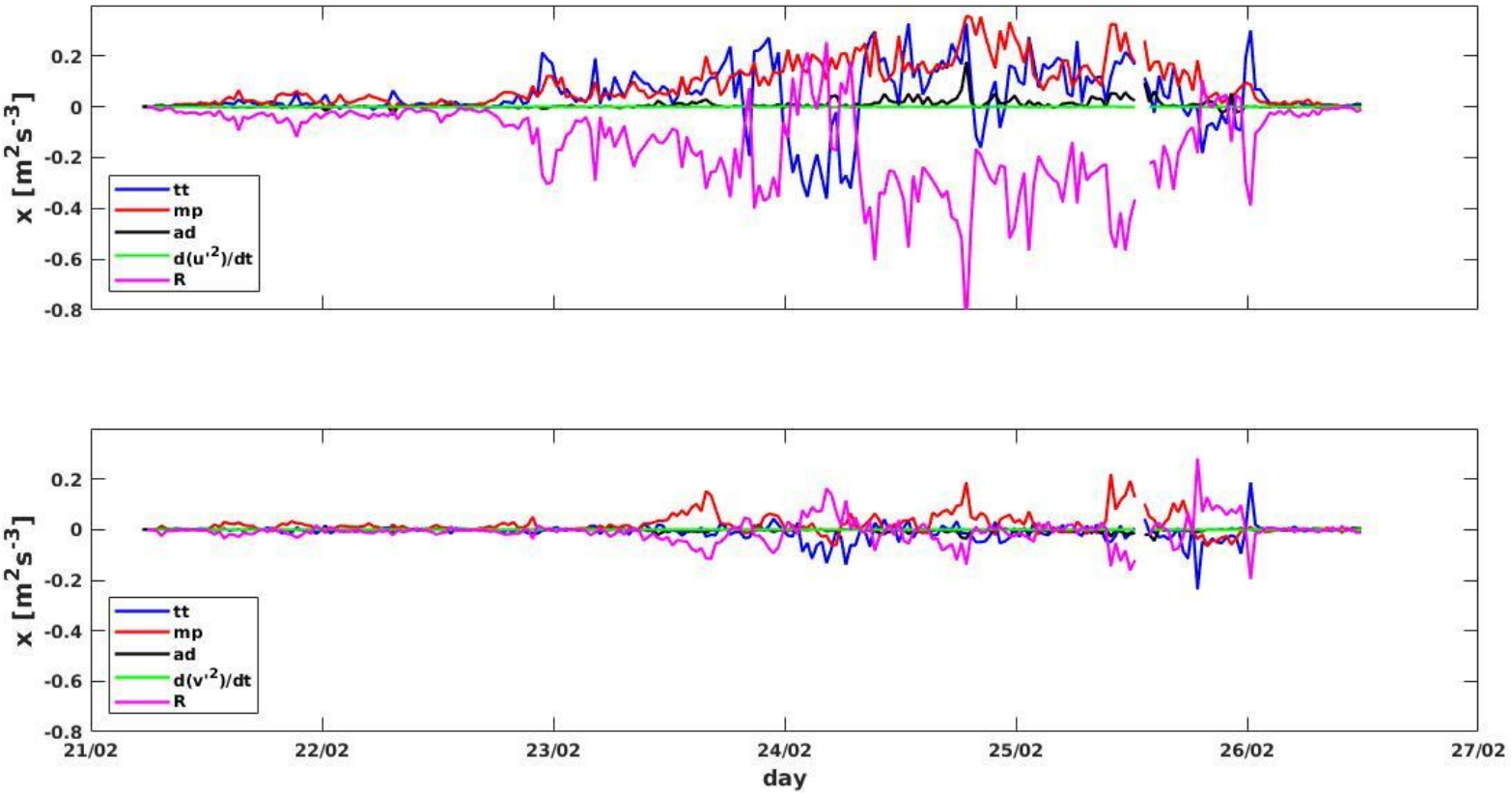
$$\frac{\partial \overline{u_i'^2}}{\partial t} = -\bar{w}\frac{\partial \overline{u_i'^2}}{\partial z} - 2\overline{u_i' w'}\frac{\partial \bar{w}}{\partial z} - \frac{\partial \overline{w u_i'^2}}{\partial z} - \frac{2}{\bar{\rho}}\frac{\partial \overline{u_i' p'}}{\partial z} - 2\varepsilon$$

AD **MP** **TT** **PR** **VD**

- two mid-levels and one bulk level → 16, 25 and 31 m
- only horizontal components

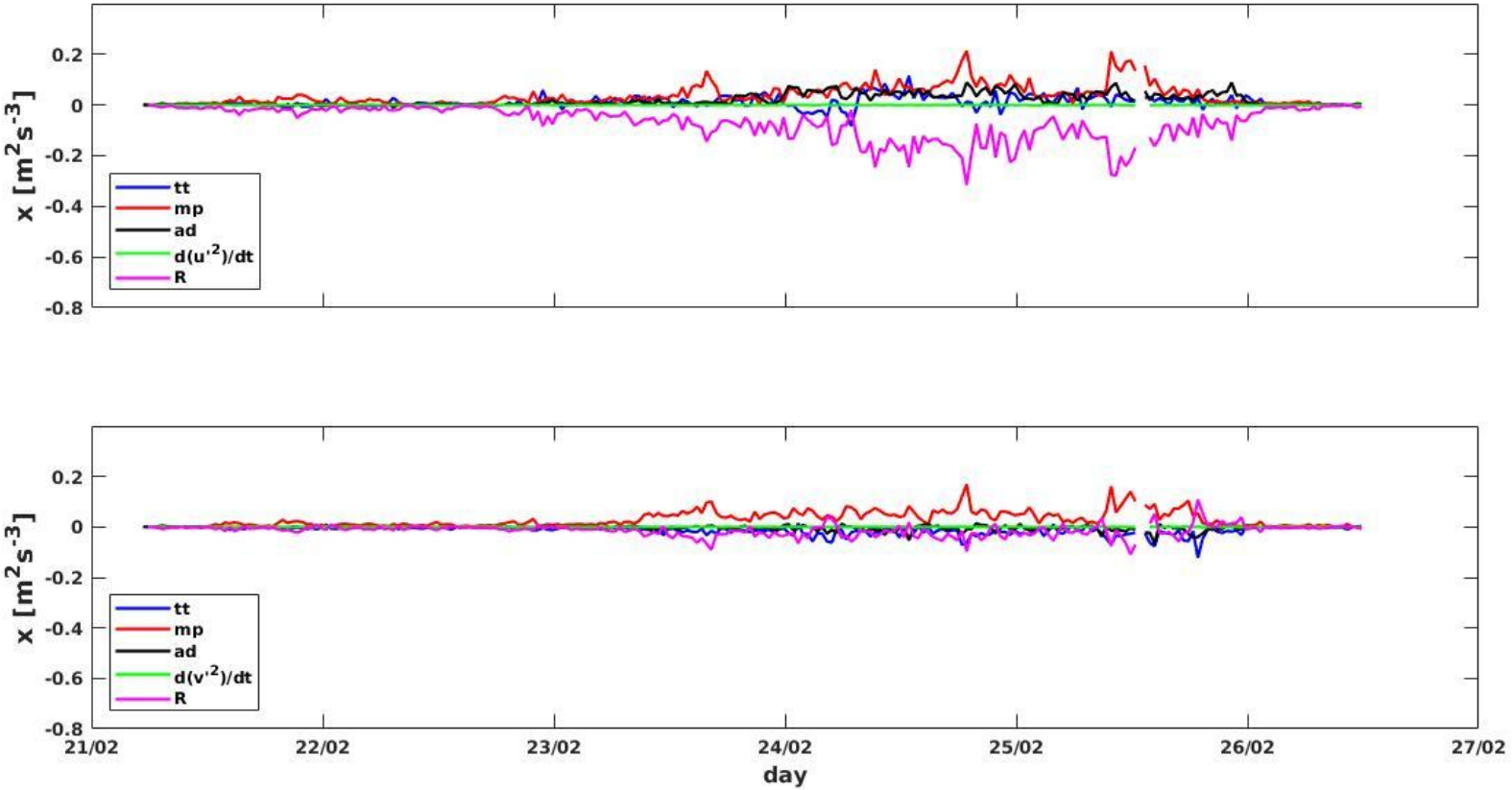
3. Results

16 m



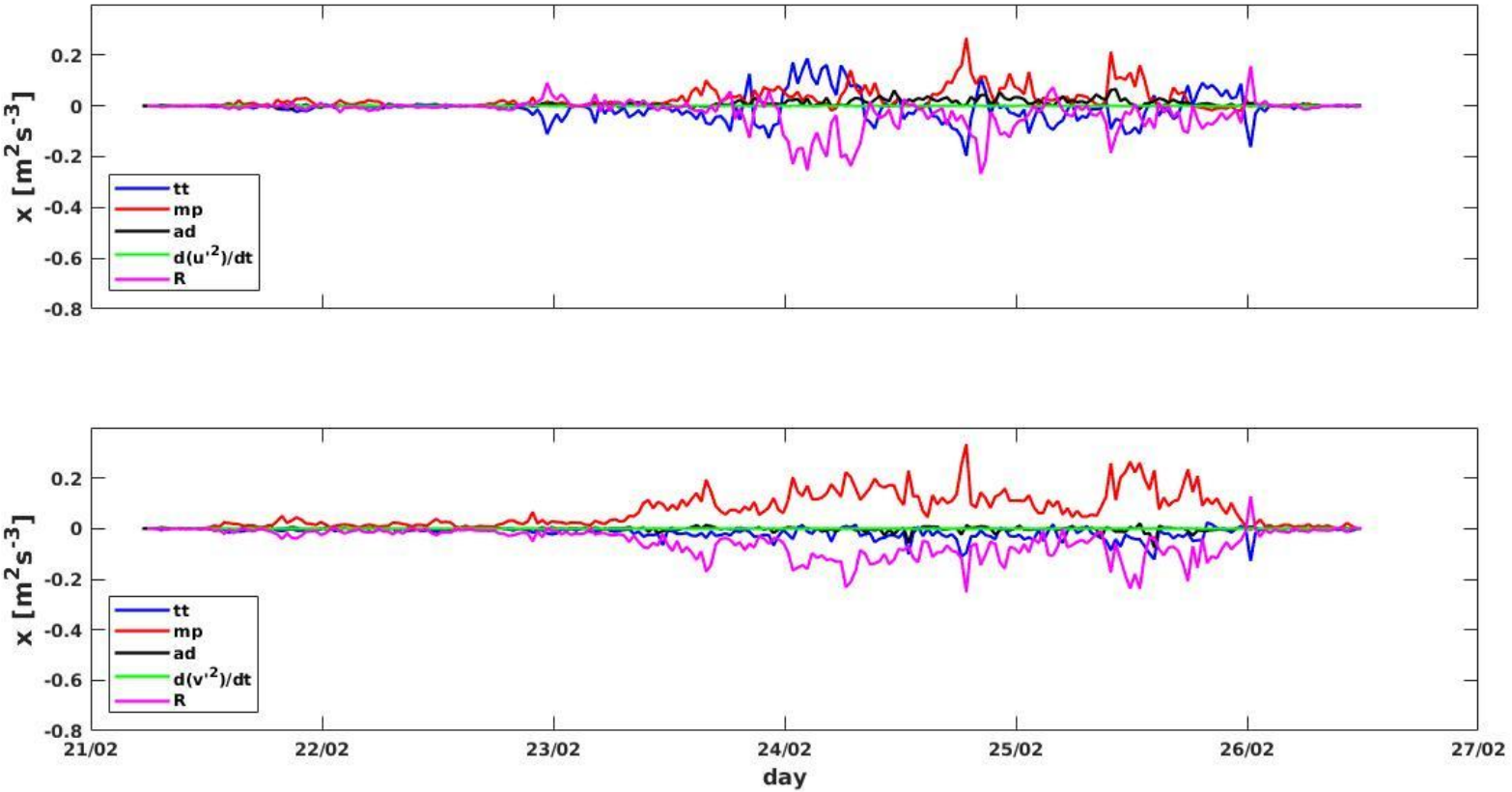
3. Results

25 m



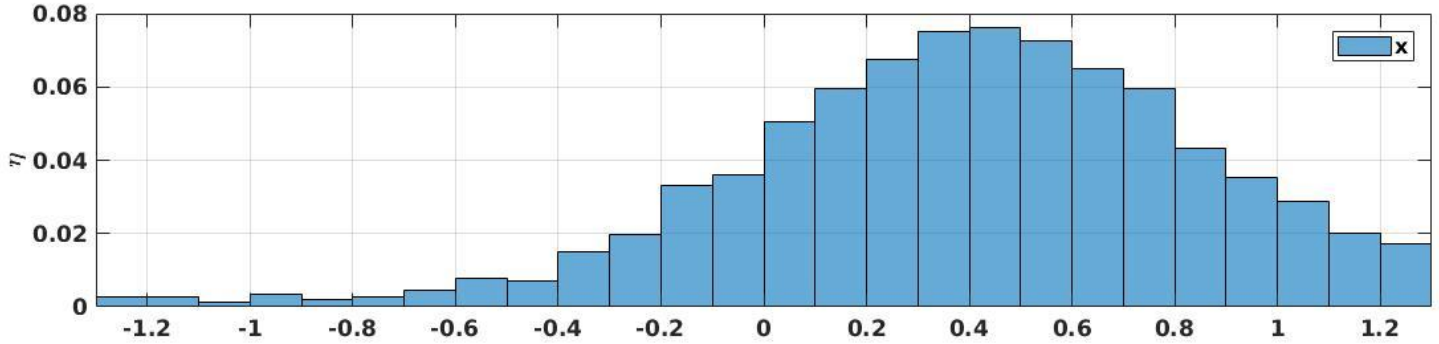
3. Results

31 m

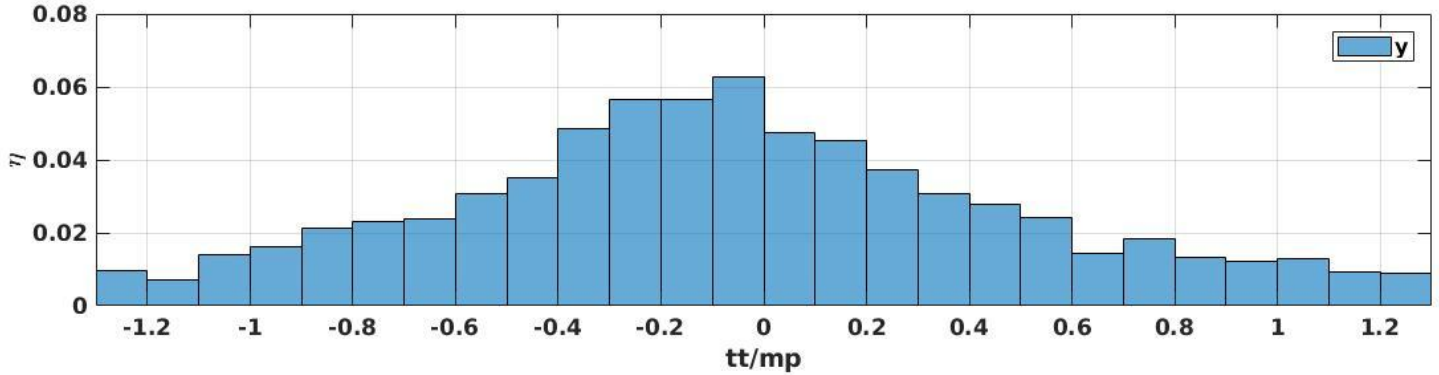


3. Results

16 m



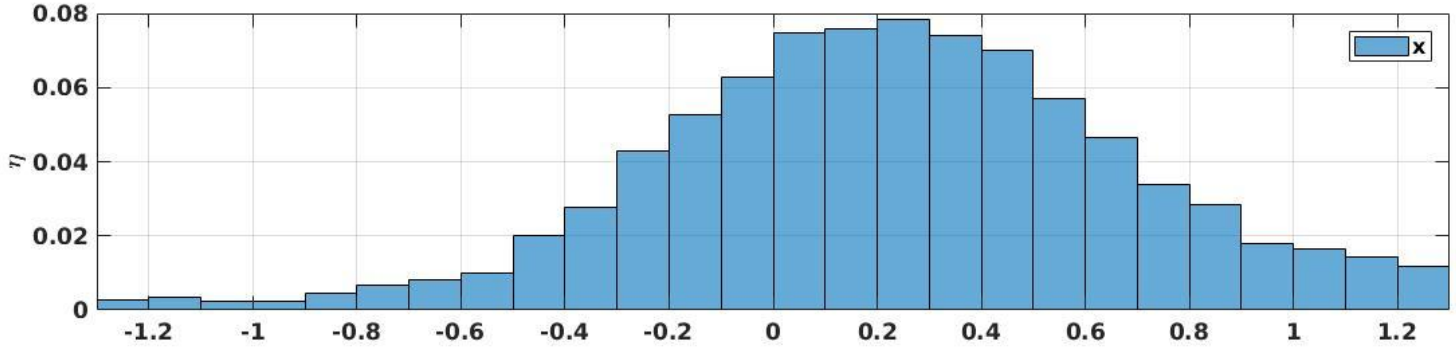
median = 0.51



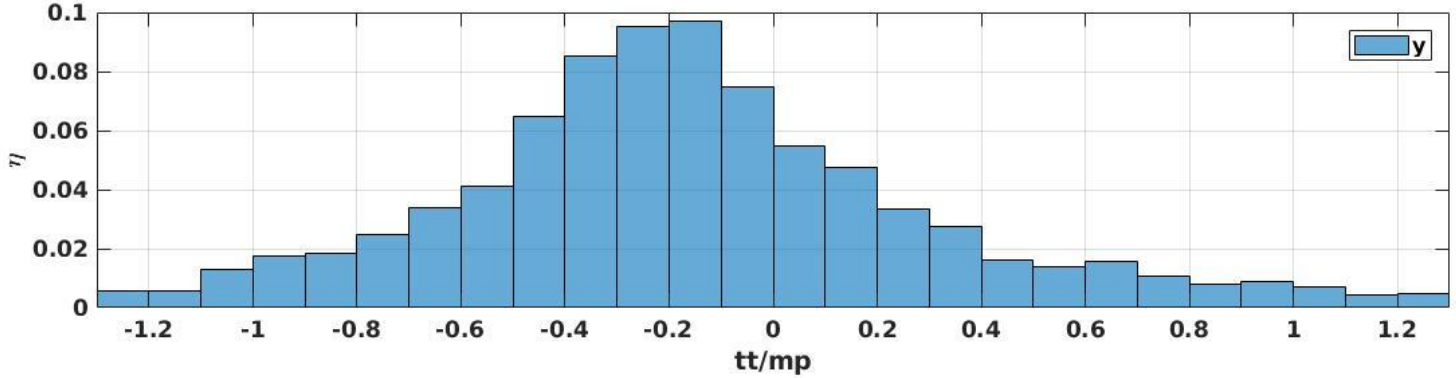
median = -0.15

3. Results

25 m



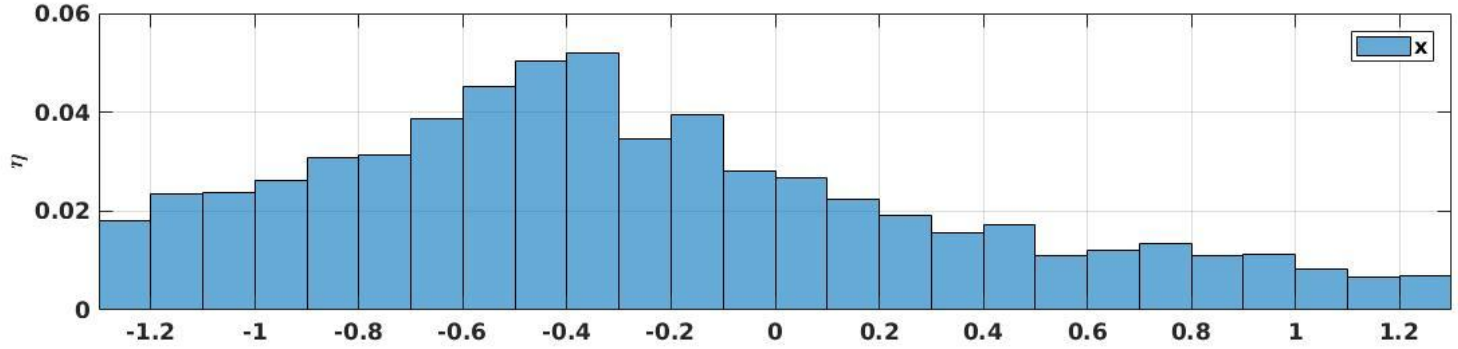
median = 0.3



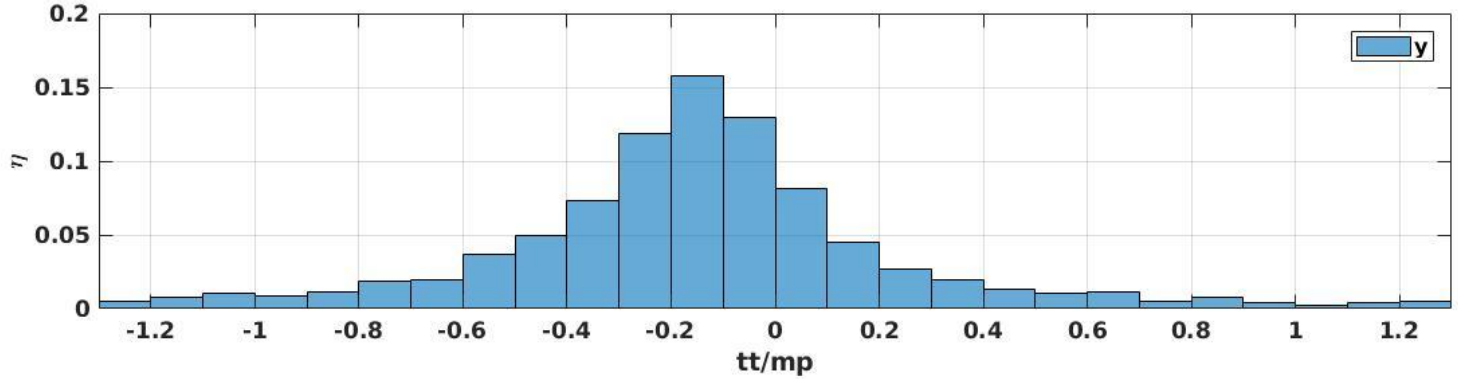
median = -0.18

3. Results

31 m



median = -0.41



median = -0.15

4. Conclusion

- turbulent transport, or triplet covariances terms are significant in intensity for bora flows
- triplet covariances can represent a loss or gain of turbulent variances
- turbulent transport in y direction → loss term
- turbulent transport in x direction → gain term at the lower levels

  → loss term at the upper level

- further work → why and under what conditions

Thank you for your attention!