

Can we use only one 6C-station to perform deep characterisation of a building?

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1 Why do we want to measure at only one location?

We would not need:

- access to multiple floors
- many instruments
- time synchronisation of all instruments
- time for set up of arrays

We would only need:

- one location on the roof
 - one accelerometer
 - one rotational sensor
 - modal analysis
- > 6C-station

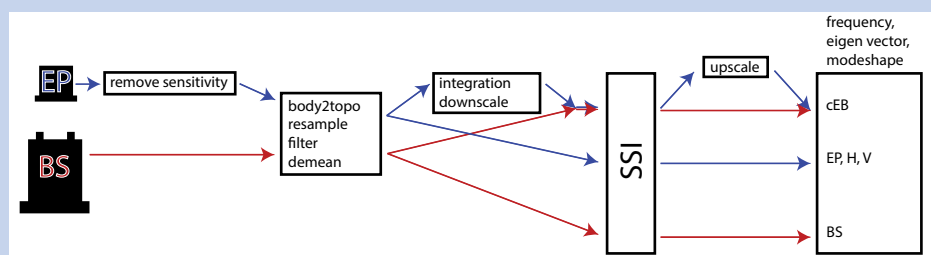


Fig 1. Processing pipeline from raw data to Stochastic Subspace Identification (SSI). cEB: combined EpiSensor and BlueSeis, EP: EpiSensor, BS: BlueSeis, H: horizontal array, V: vertical array.

2 Prime Tower Building and Instrument Set-Up

- 126 m height (3. highest in CH)
- highly urban area
- stiff reinforced concrete shear walls as the core
- glass facades all around the tower
- river sediments in subsurface
- high groundwater level



Fig 2. Instruments used for study.

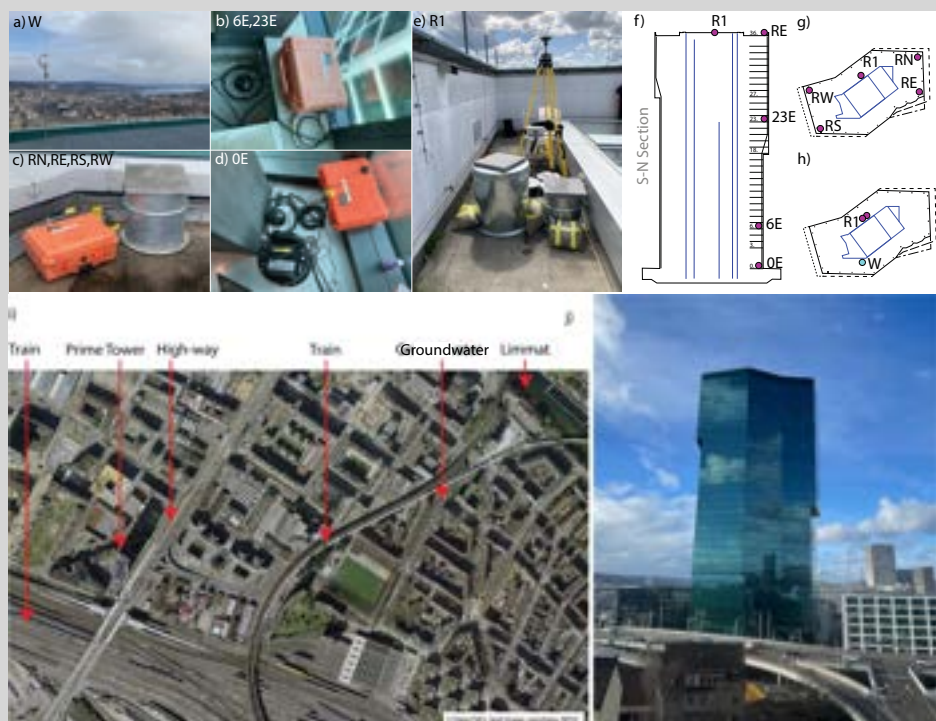


Fig 3. a) The weather station. b) Locations 23E and 6E. c) Instruments in the corners of the roof (denoted by R). d) Location 0E. e) Installation at R1 including a GNSS antenna, BlueSeis and acceleration sensor. f) S-N section with the vertical array (V) station location in pink. g) The roof floor plan with the horizontal array (H) station location in pink. h) The location R1, where the single stations (EP,BS) are located and from which the 6C-station (cEB) is combined. i) Aerial view of the area around the Prime Tower (PT). j) A southward view of the Prime Tower.

References: map.geo.admin

3 Modeshapes of 3 Primary Modes

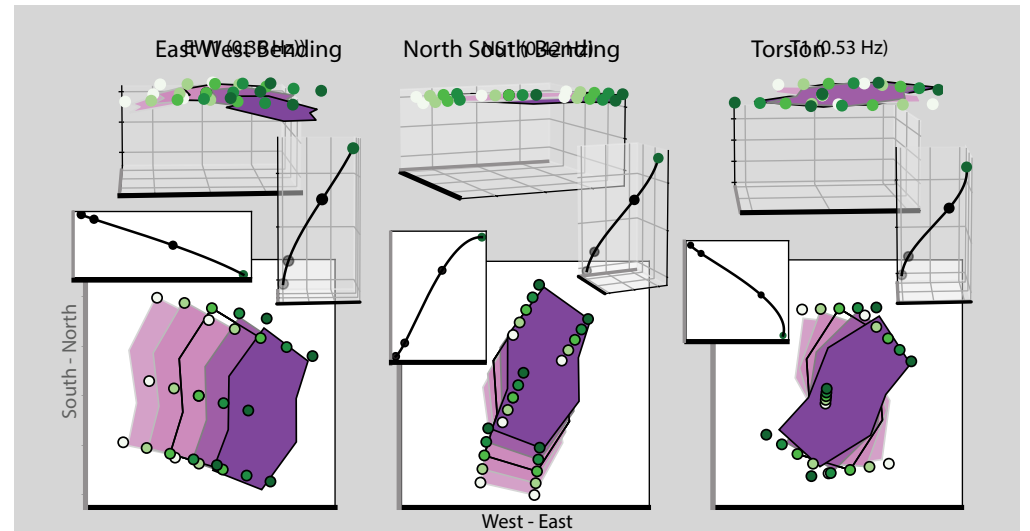


Fig 4. The first three modes EW1, NS1 and T1 are visualized using three different instrument set ups; horizontal array, vertical array, 6C-station.

4 Frequency Variations on Different Scales

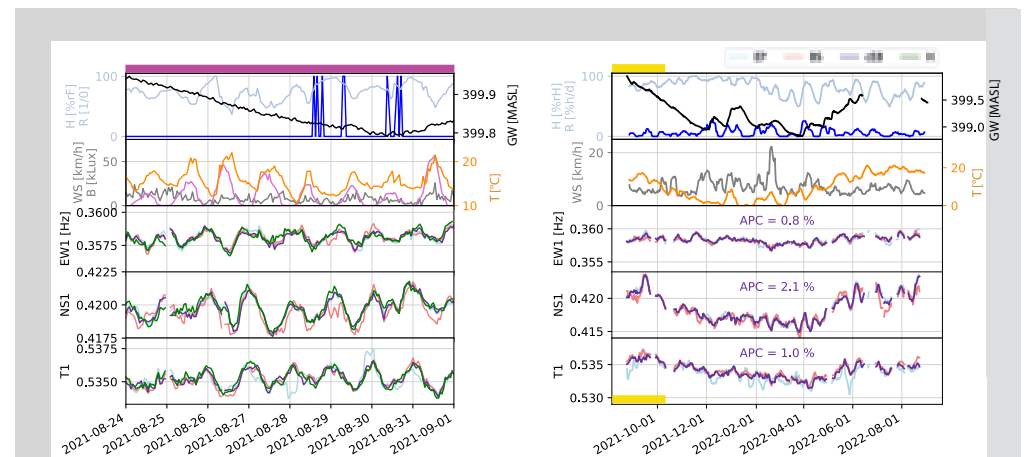


Fig 5. Left: Comparison of the 6C-station, single station and the array instrument set-ups, 6 hour moving average (MA). Right: weekly MA. Below: 6 hour MA.



5 Conclusion

- 6C-station can replace an array of accelerometers distributed in-plane
- frequencies can be tracked as well as with an array of 5 instruments
- 6C-eigenvector of the roof can be defined, distinguishing between translational and rotational modes