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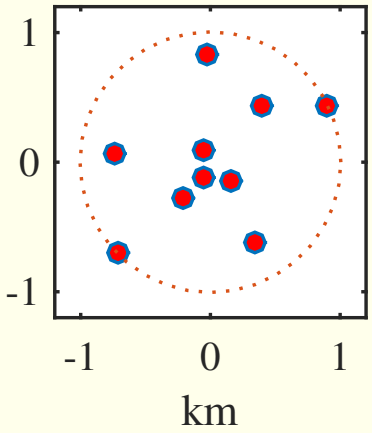
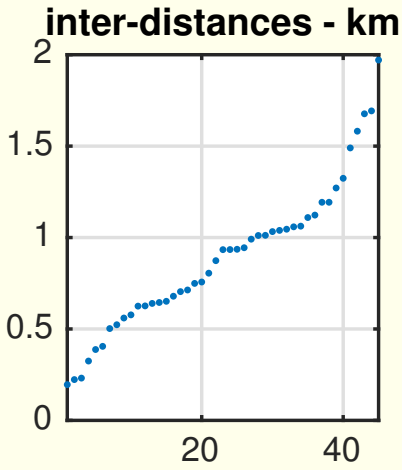
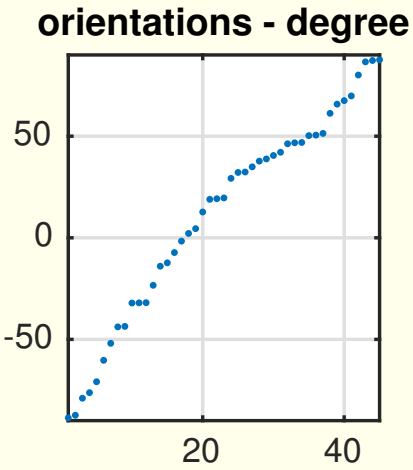
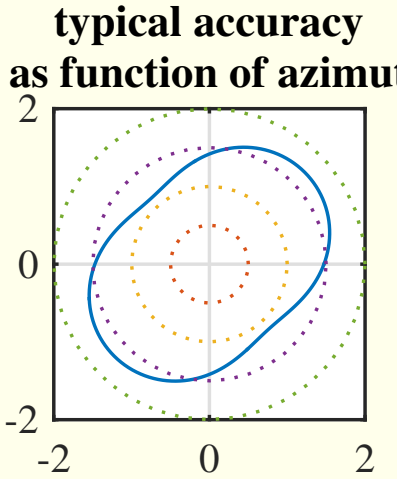
Features for a station design





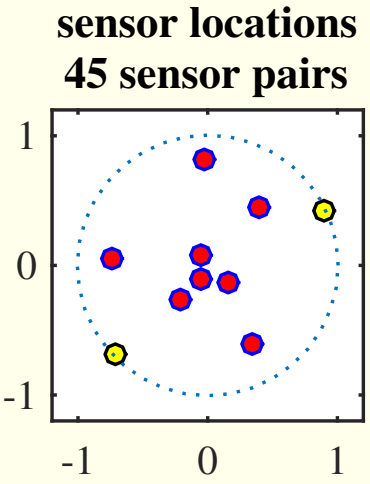


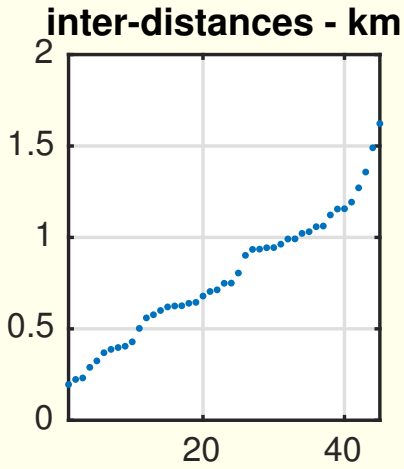


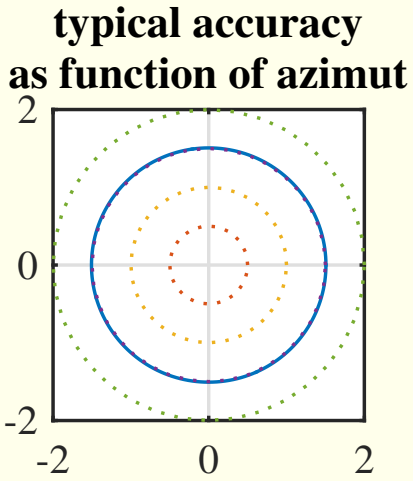
Elements of interest:

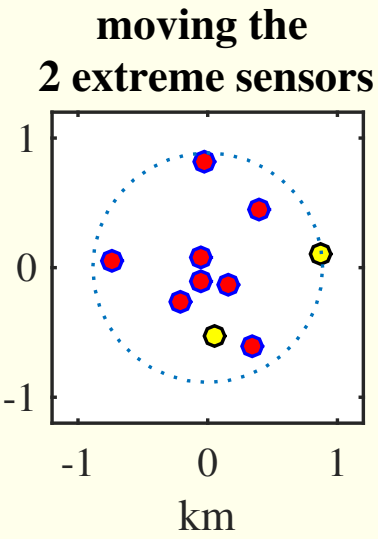
- the aperture
- the relative locations of the sensors
  - → uniformity
  - → accuracy isotropy

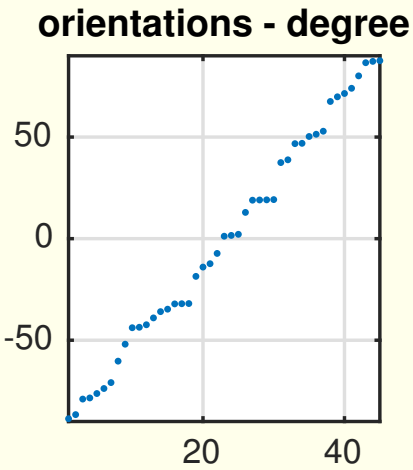
By moving the 2 extra sensors





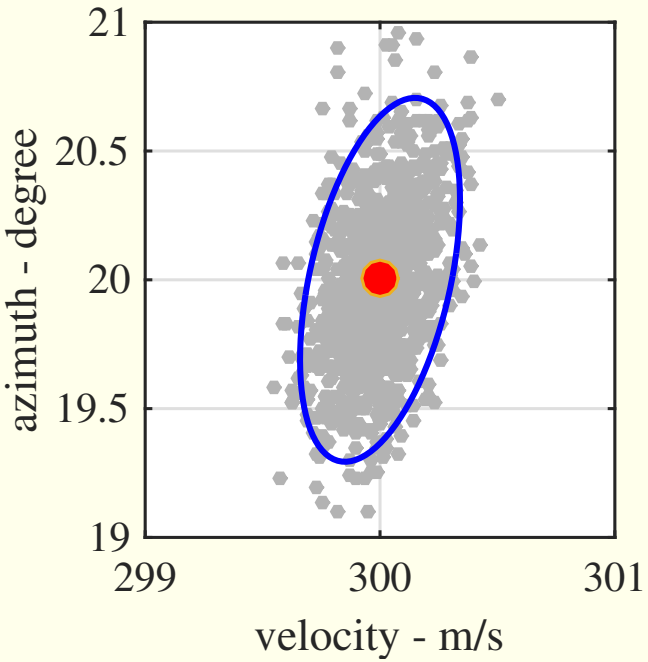






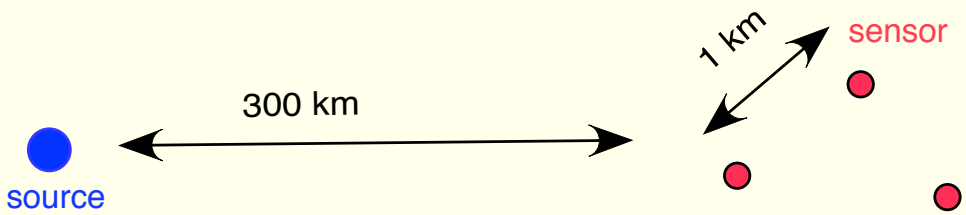
CRB

Consider that we have to estimate, form the data, the horizontal velocity and the azimuth.



- the grey points are the estimated pairs of values during many outcomes,
- the CRB gives the expression of the ellipse that allows to perform a confidence region around the true value (red point)
- it is worth to notice that the CRB does depend on the true values. Usually we replace by the estimated value.

Loss of coherence



- usually the sensors of the same station are very far from the source of interest, several hundreds of km compared to 1 km.
- however the signals arriving on the two sensors are not fully coherent. But in the absence of clear explanations a "black box" model is considered:

$$\log \mathrm{MSC}(f) \approx -\beta f^2 \times d^2$$

where d is the distance between deux points of observation, f the frequency and β a LOC decay factor.
This simple model does not take into account the orientation of the sensor axis w.r.t. the direction of arrivals.

IS37, with 10 sensors then 45 interdistances

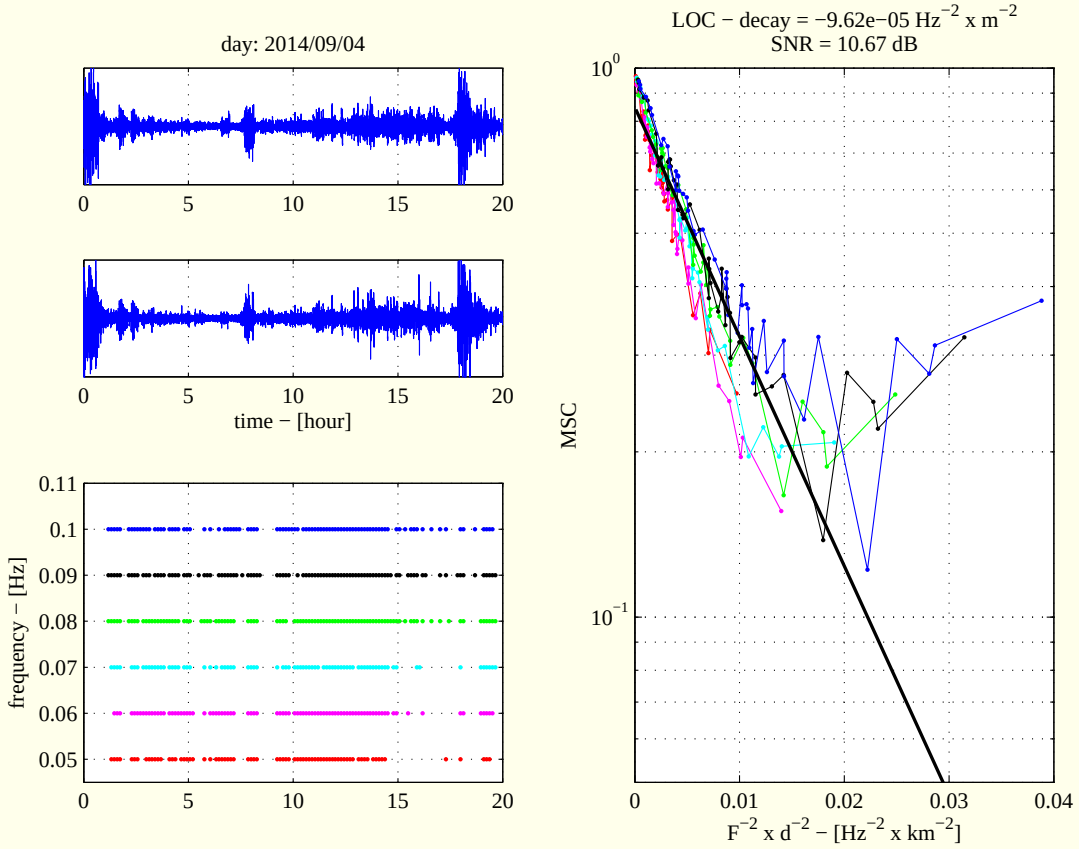


Figure: *Signals on about 20 hours. For the 6 selected frequencies, time slots where the MSC on the 3 nearest sensors is over 0.8 are considered. The 6 curves of the MSCs as a function of the interdistances.*

- for a given frequency in the selected band of interest, if the MSCs on the 3 nearest sensors are over 0.8, we keep this time slot for all combinations of interdistances.
- we average on the full duration.

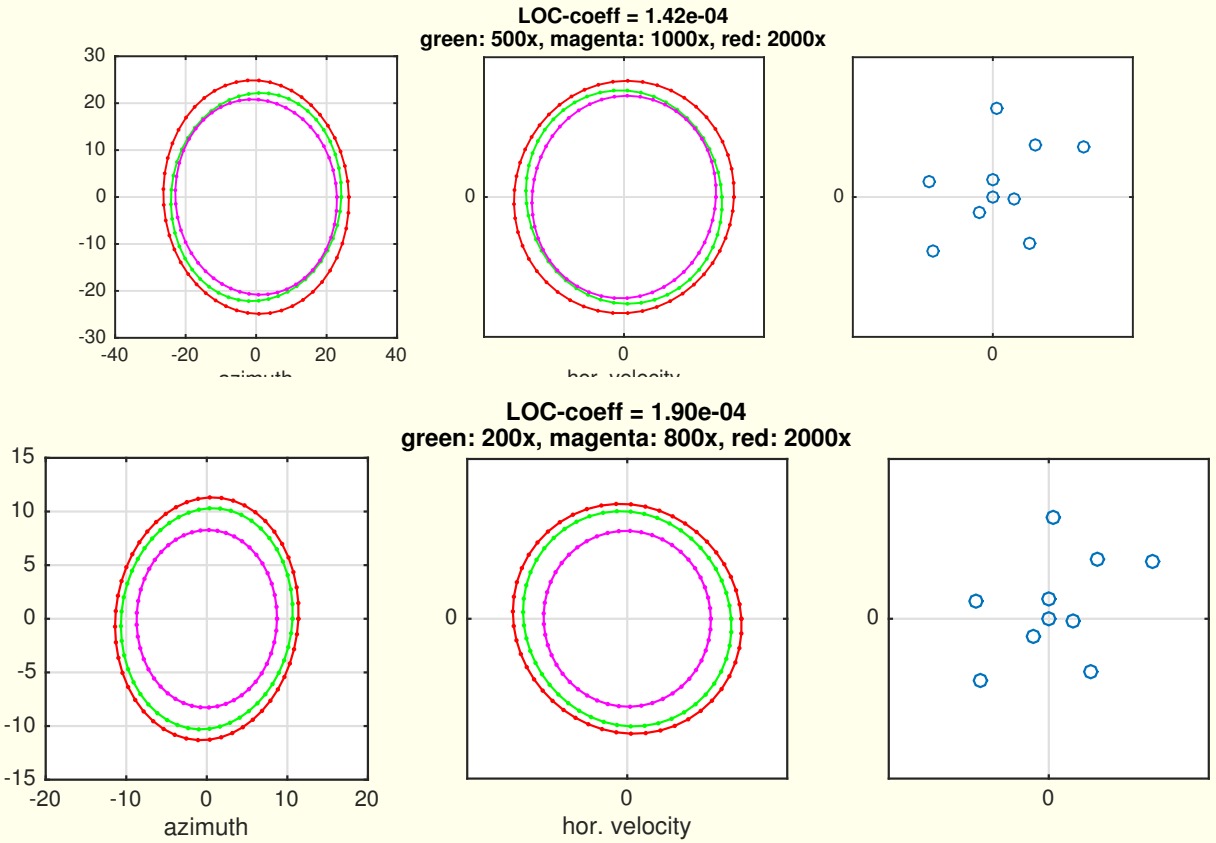


Figure: *500, 1000, 5000 are the aperture multiplicative factor of the I37 template reported on the RHS of the figure. LOC factor is* $\beta = 0$ *and* $\beta = 1.9e^{-4}$*. Maximal frequency* 0.18 *Hz.*

In presence of LOC, we see that the precision passes by a optimum for $R = 1000$.