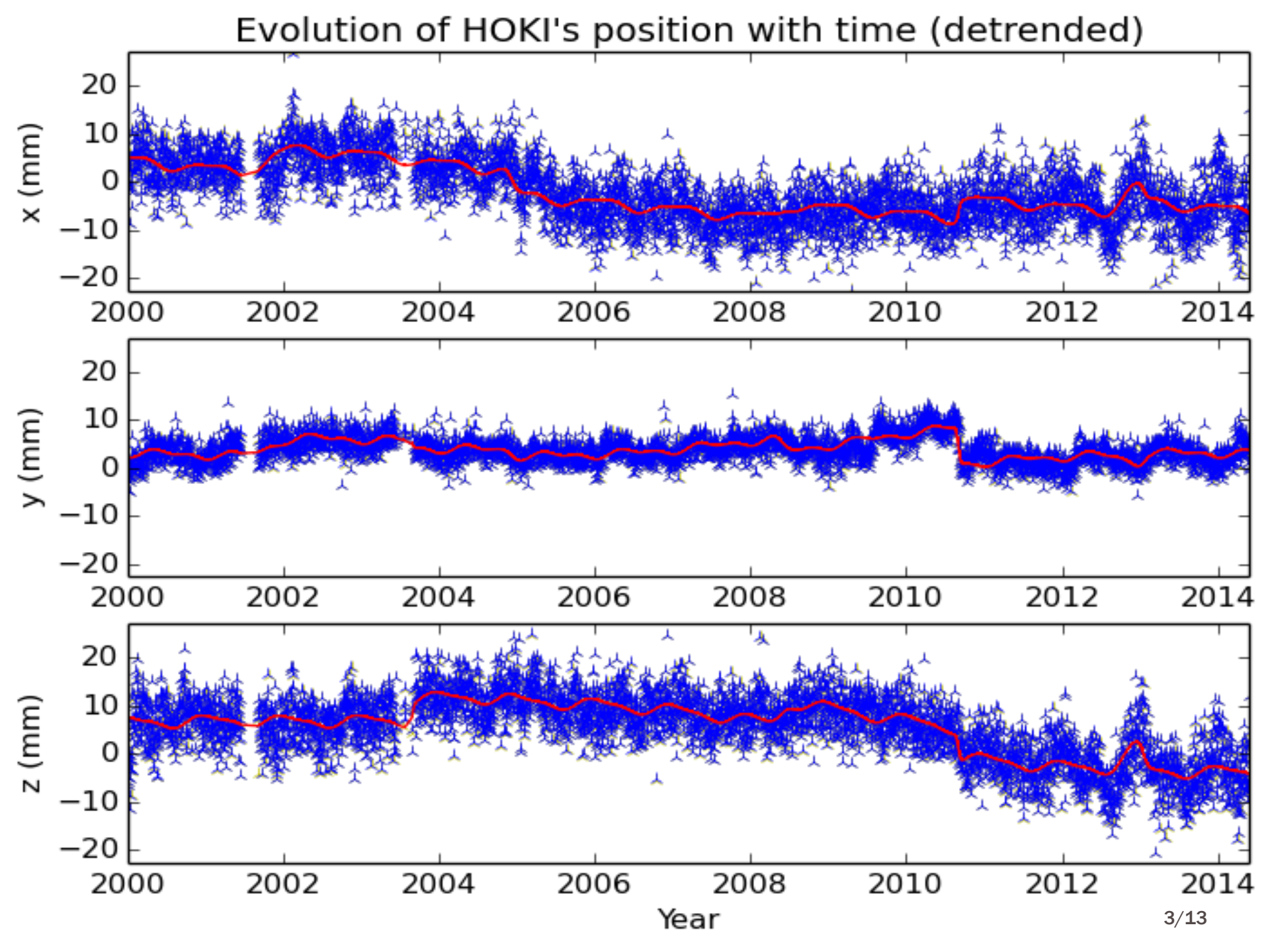
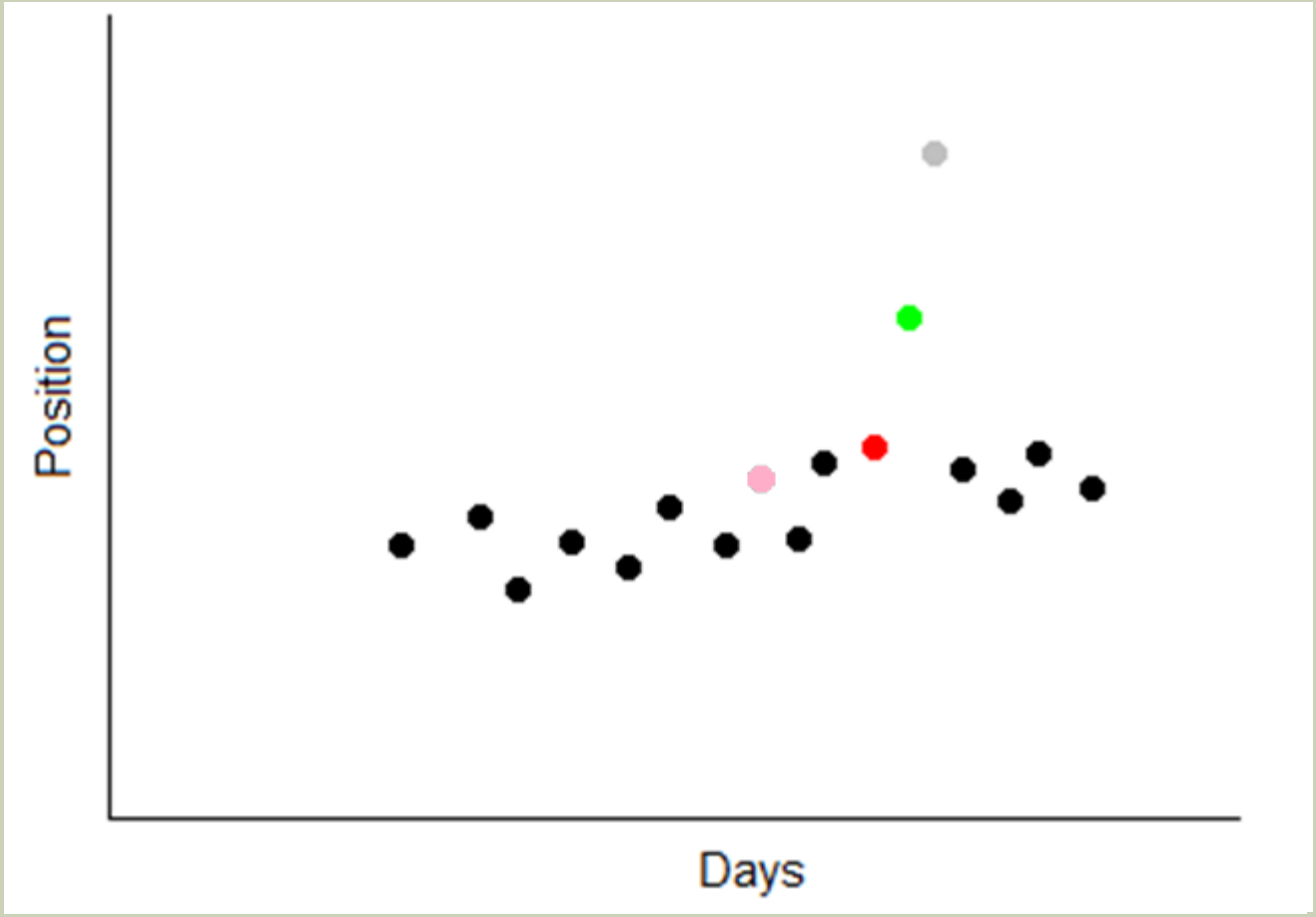
AUTOMATIC DETECTION AND CORRECTION OF EARTHQUAKES AND SLOW SLIP EVENTS IN GNSS TIME SERIES

CONTENTS


Evolution of HOKI's position with time (detrended)
x (mm)
y (mm)
z (mm)
20
10
0
−10
−20
2000
2002
2004
2006
2008
2010
2012
2014
Year

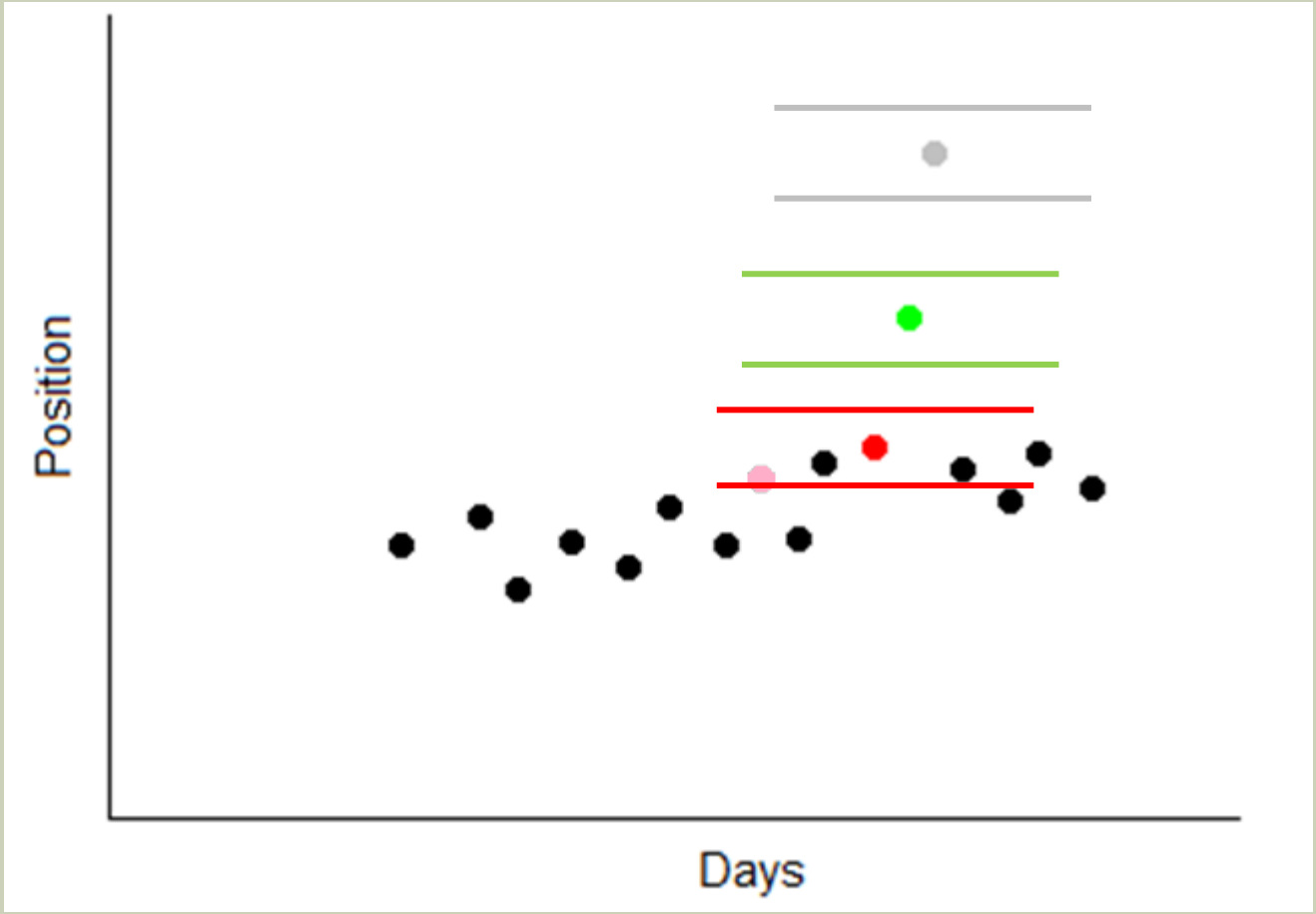
REMOVING OUTLIERS

- Complex backwards loops



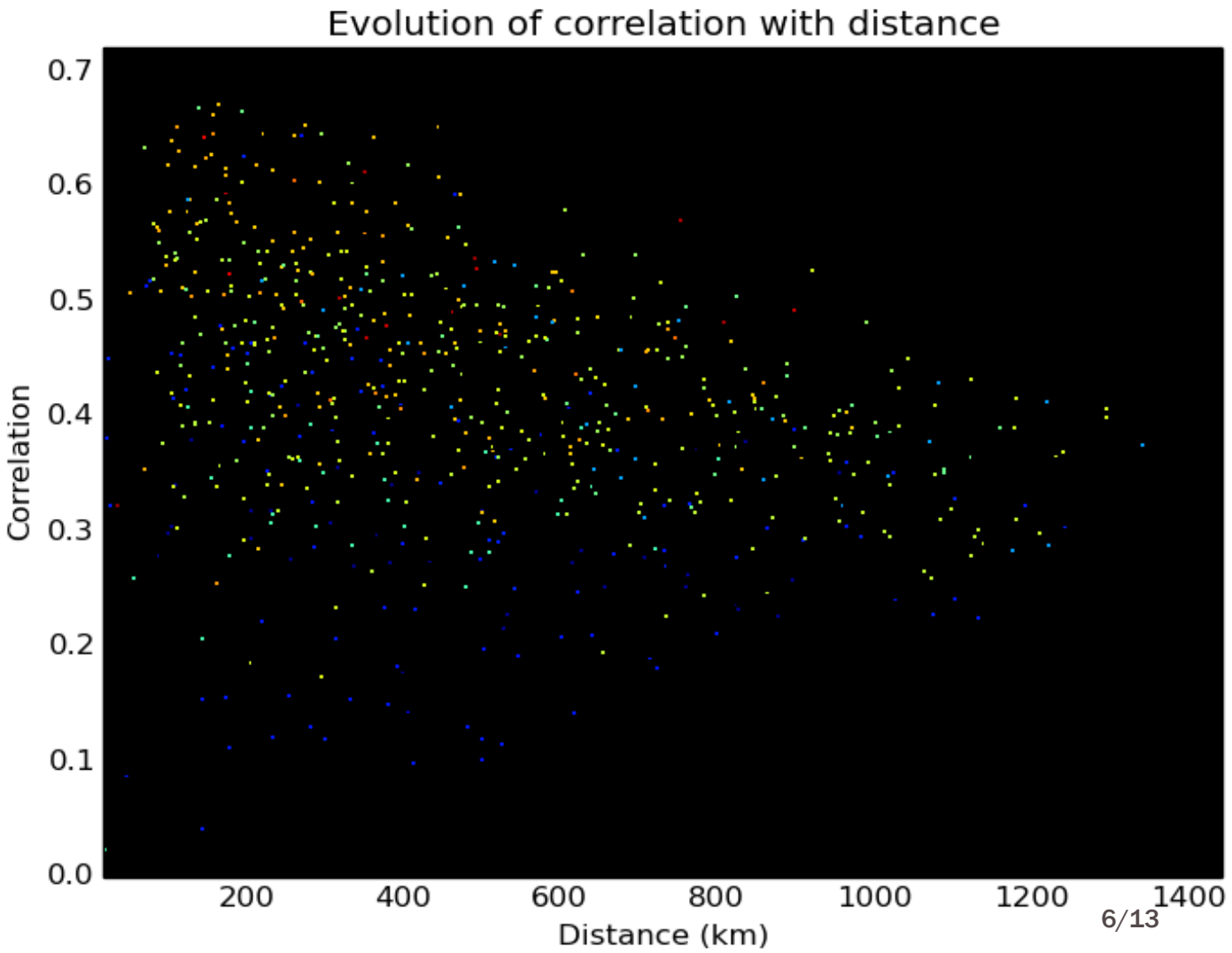
REMOVING OUTLIERS

- Testing different methods



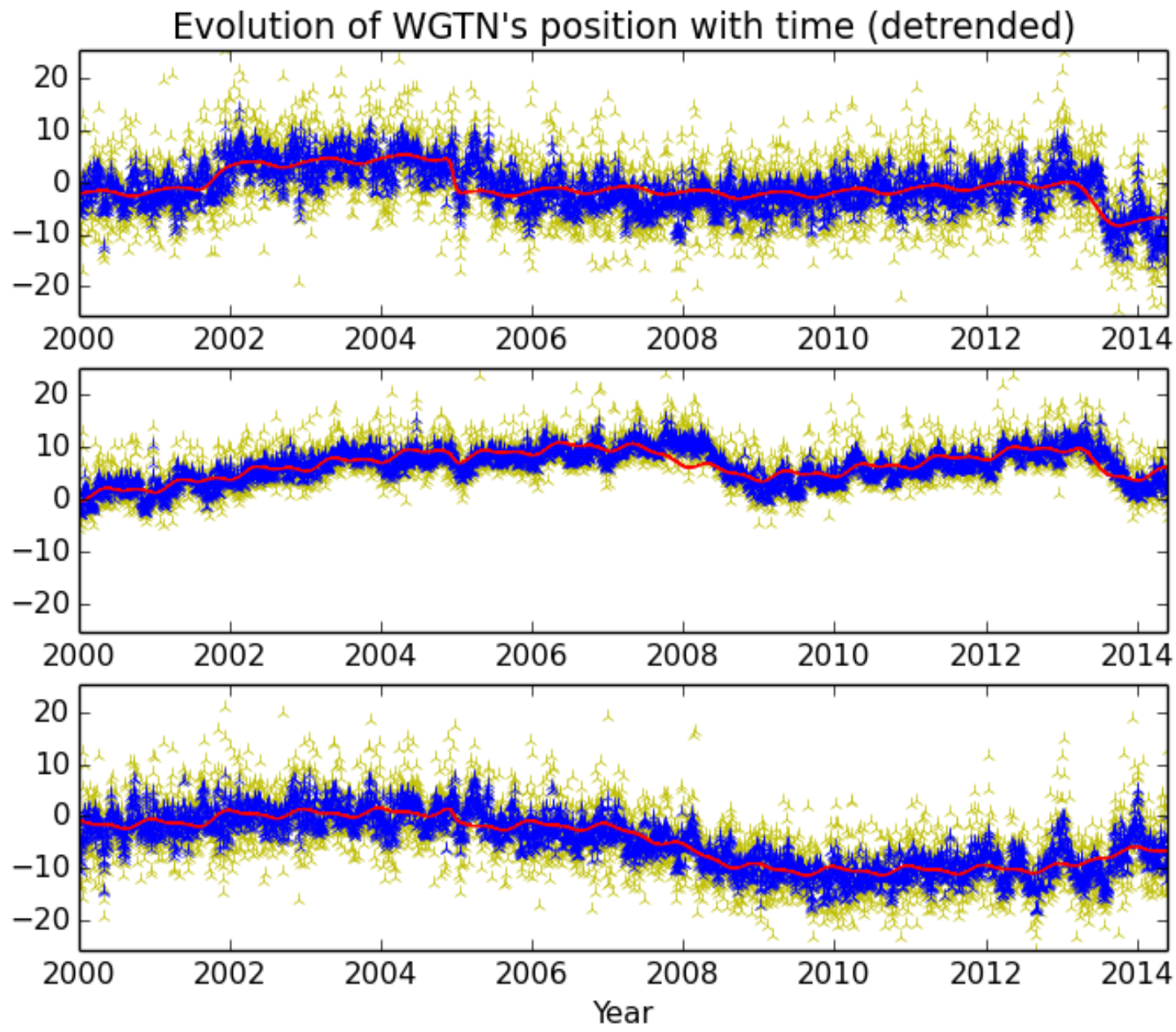
REMOVING NOISE

The importance of spatial splining



REMOVING NOISE

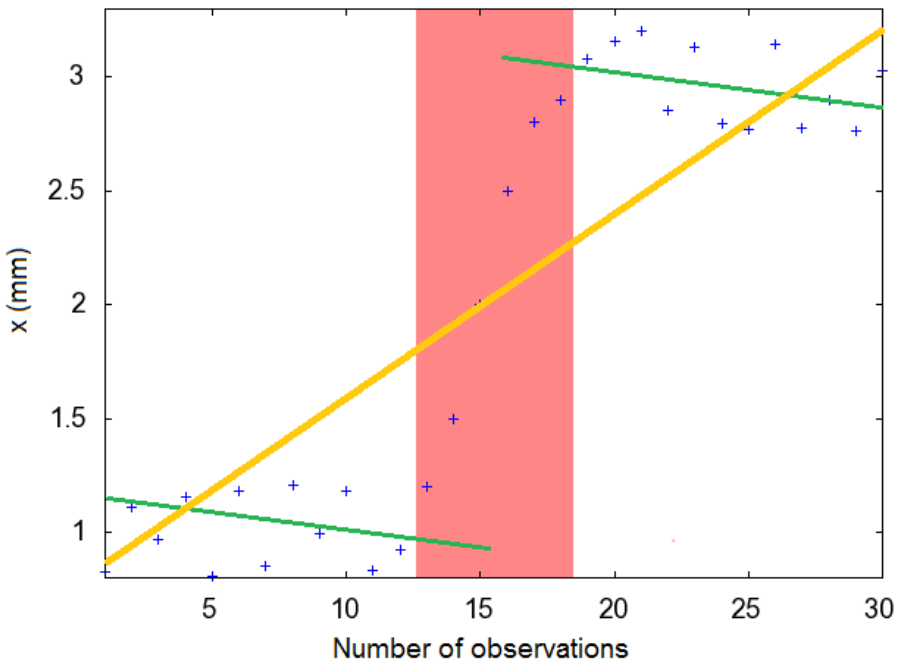
The PositioNZ network



REMOVING NOISE

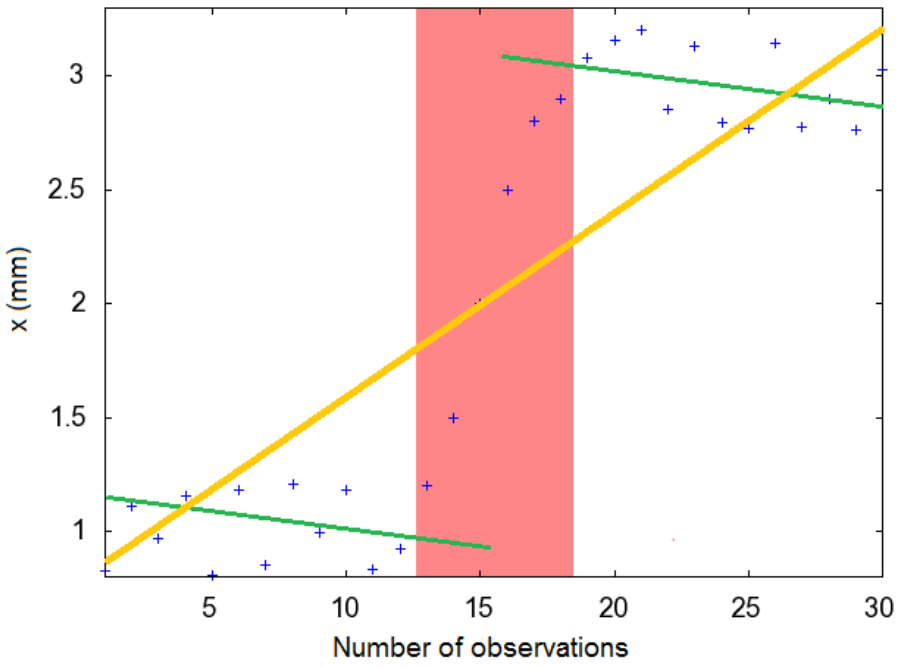
DETECTING THE JUMPS

Simple jump

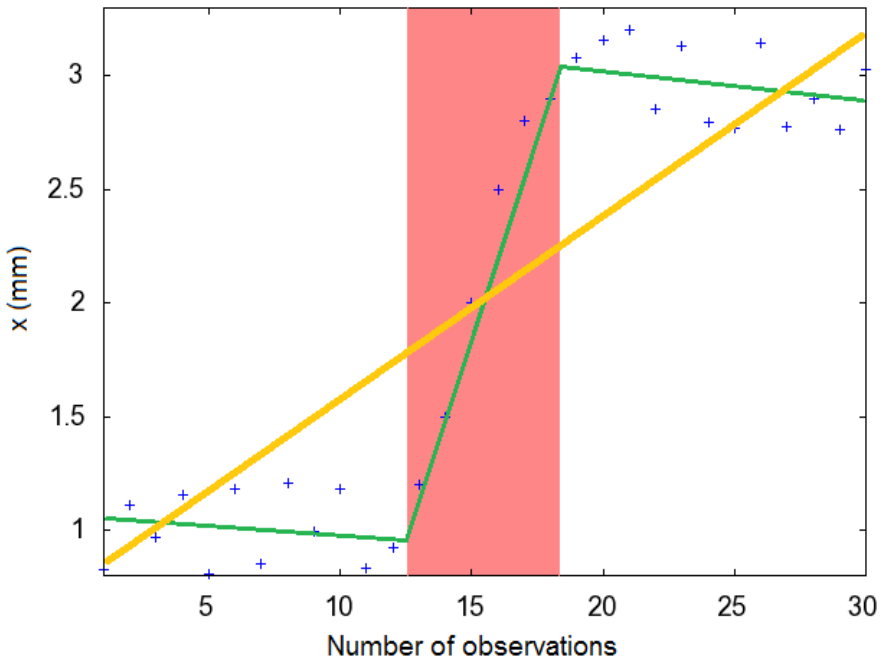


DETECTING THE JUMPS

Simple jump



Ramp



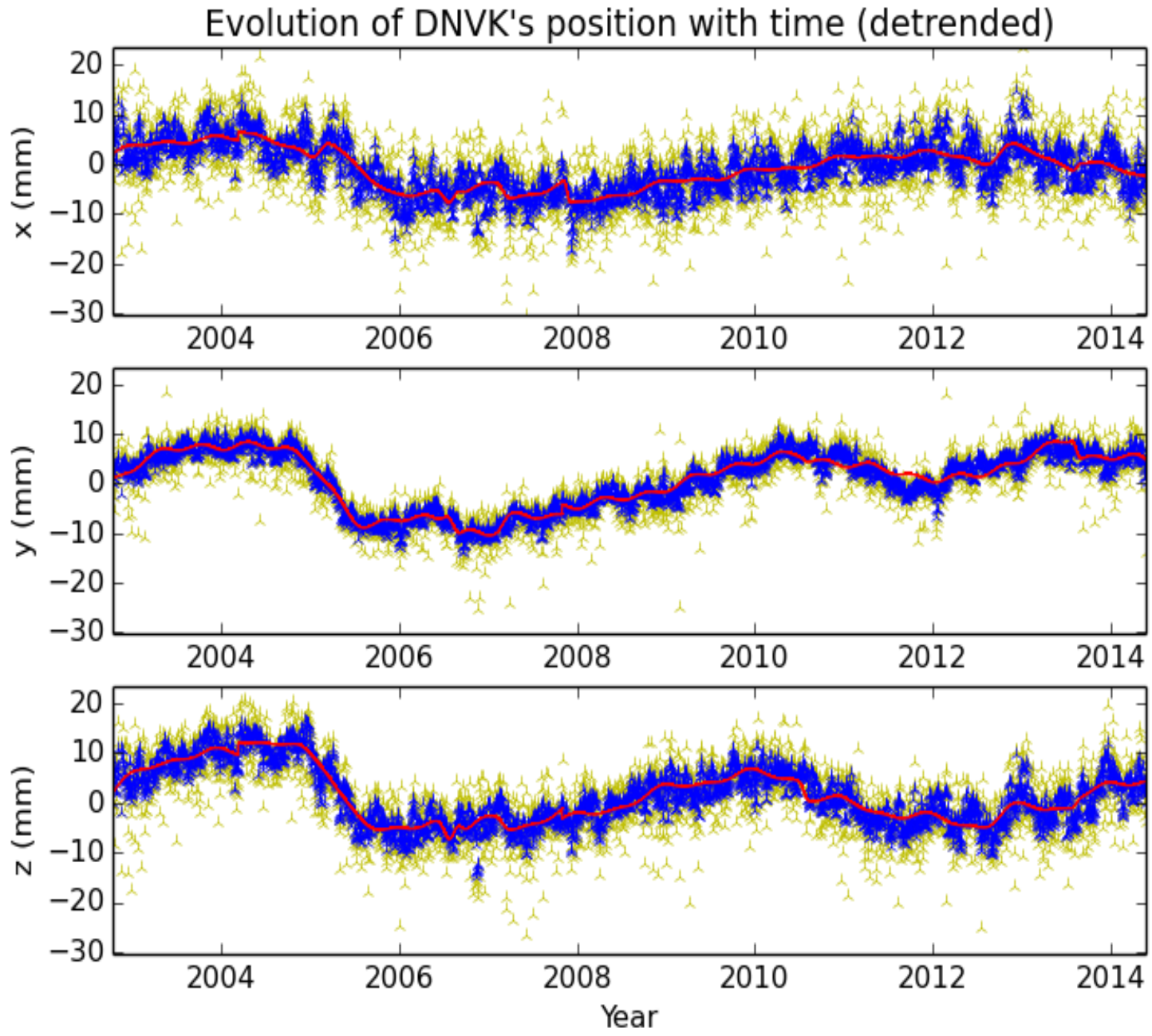
DIFFICULTIES ENCOUNTERED

An unadapted statistical tool

- Required assumptions on data for an F-Test:
- Normal distribution law
- Independent observations

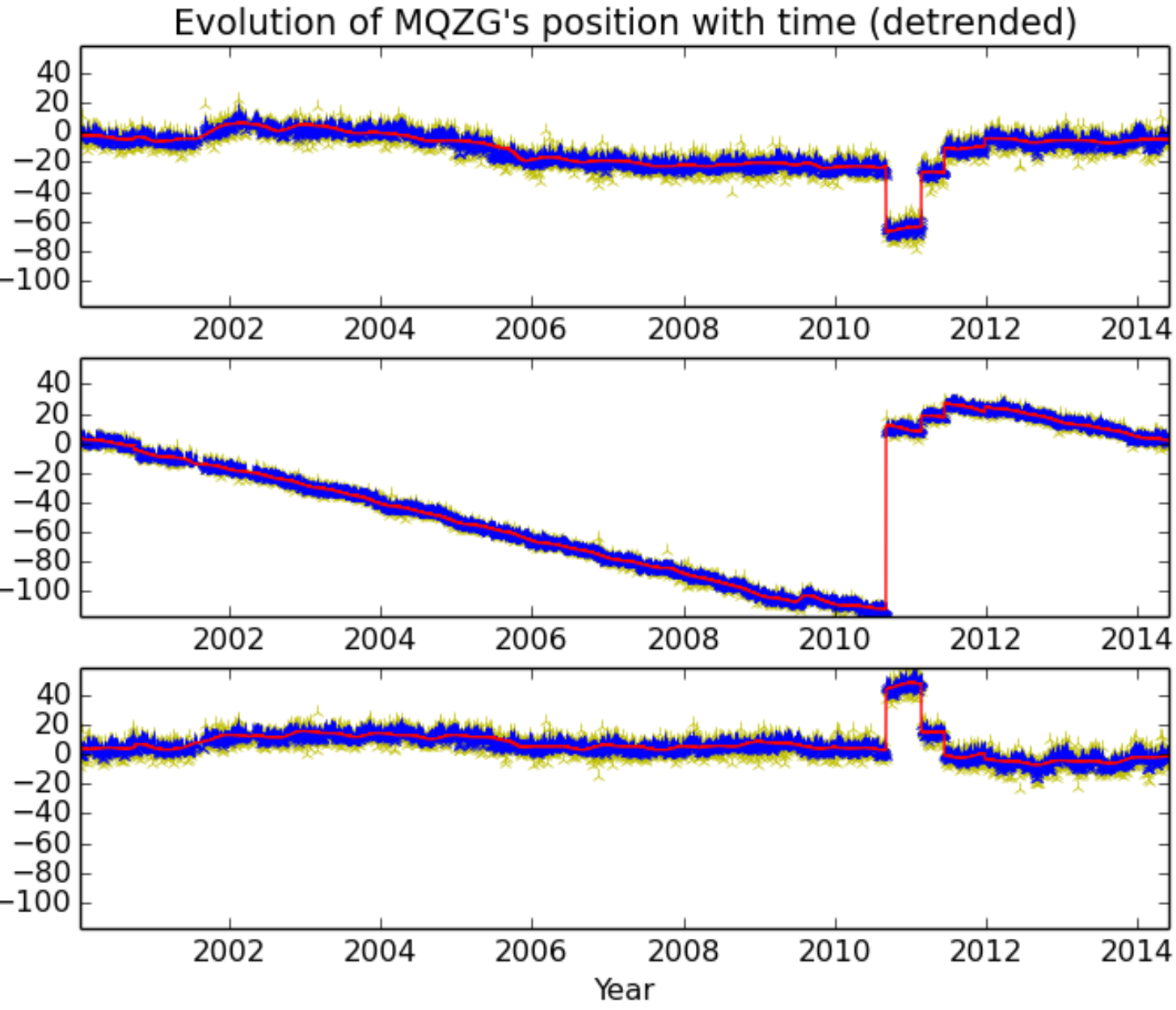
Dealing with overlapping events

The problem of noise

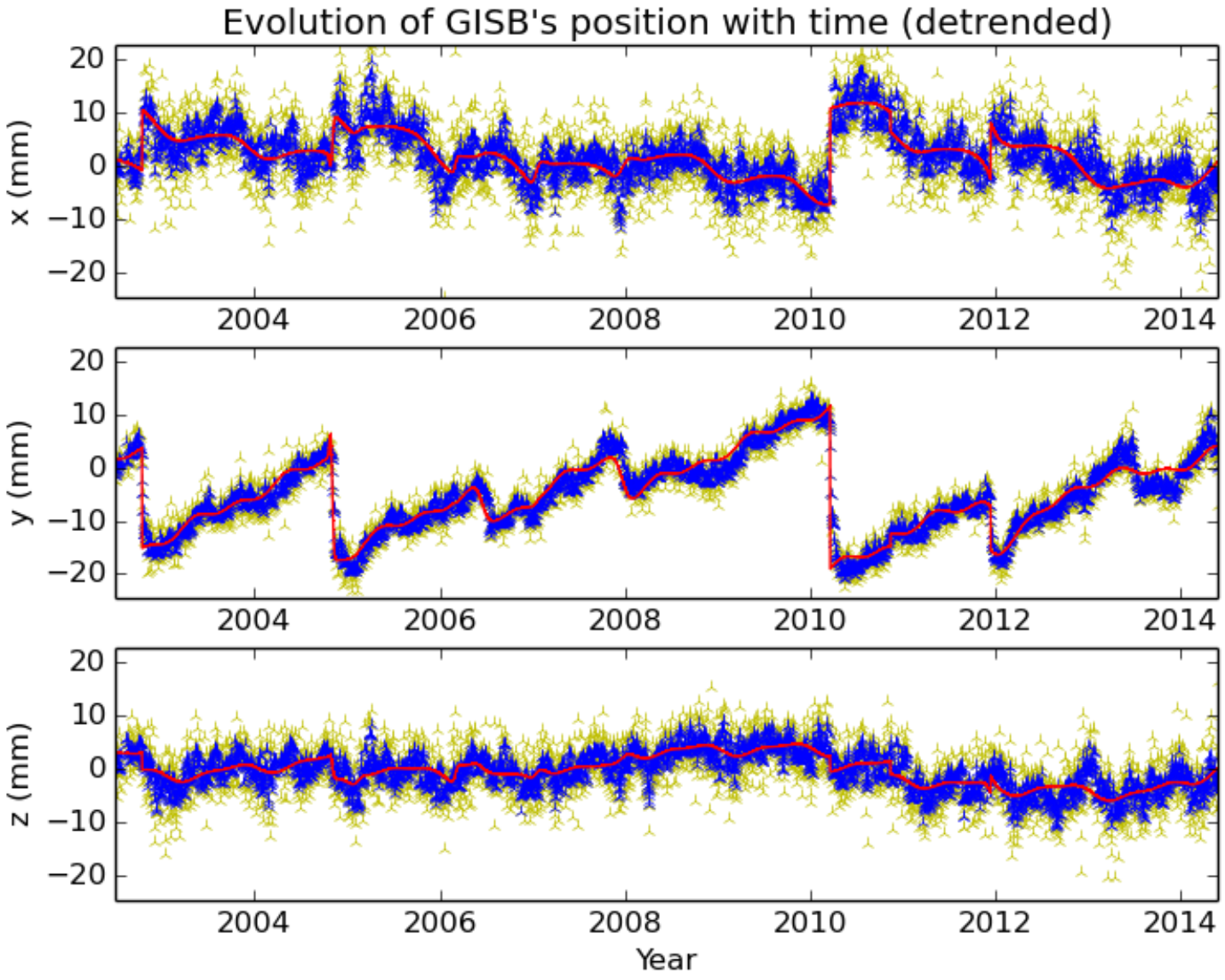

Evolution of DNVK's position with time (detrended)
x (mm)
y (mm)
z (mm)
20
10
0
−10
−20
−30
2004
2006
2008
2010
2012
2014
Year

RESULTS

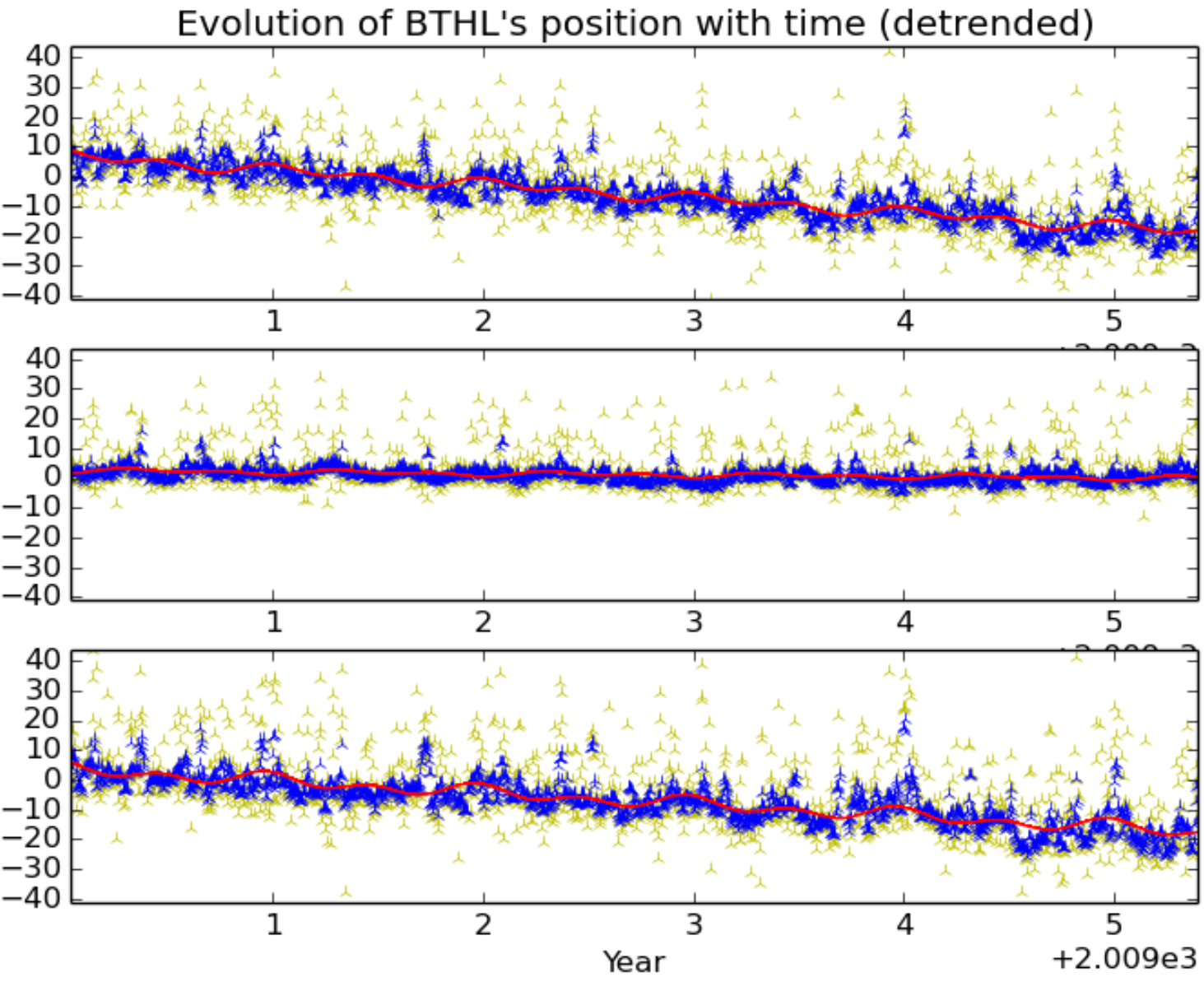
THANK YOU FOR YOUR ATTENTION



CHRISTCHURCH


Evolution of GISB's position with time (detrended)
x (mm)
y (mm)
z (mm)
20
10
0
−10
−20
2004
2006
2008
2010
2012
2014
Year

GISB


Evolution of BTHL's position with time (detrended)
40
30
20
10
0
−10
−20
−30
−40
1
2
3
4
5
Year
+2.009e3

BTHL

$$F = ((ssrR - ssrU) \times dof\ U)/(3 \times ssrU)$$

where:

- ssrR and ssrU are the sums of the least square residuals for the restricted and the unrestricted model, respectively;
- dofU is the number of degrees of freedom for the fitting of the unrestrained model;
- the 3 comes from the difference of degrees of freedom between the unrestrained and the restrained model, as we are fitting all dimensions (east, north, and up) at once.