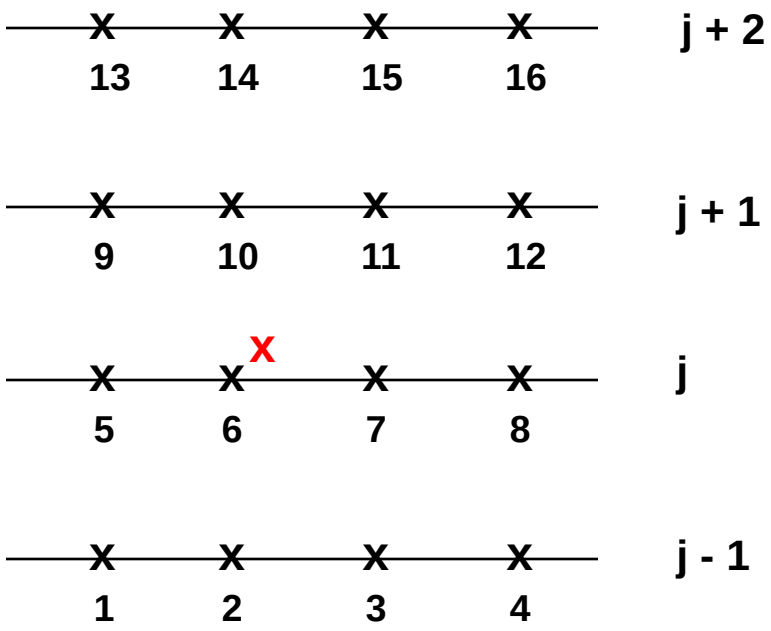
Bicubic interpolation

Case 1 : 16 neighbours on 4 different latitudes;
Reference source point (6) found below on the left
=> target point has two rows above, two rows below,
two columns on the right, two columns on the left



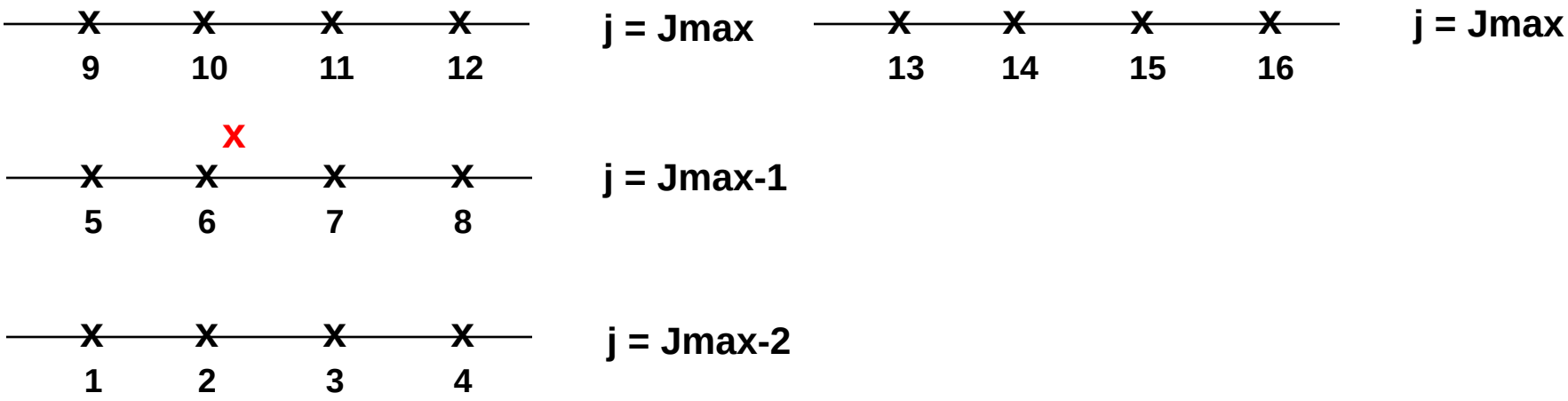
x : source points

x : target point

6 : reference source point found by the search

Bicubic interpolation: gaussian reduced grid

Case 2 : reference source point (6) found below on the left located on j = Jmax-1
→ Possible because last row close to the North pole



13 is shifted by ~180 deg towards 9
14 is shifted by ~180 deg towards 10
15 is shifted by ~180 deg towards 11
16 is shifted by ~180 deg towards 12

x : source points

x : target point

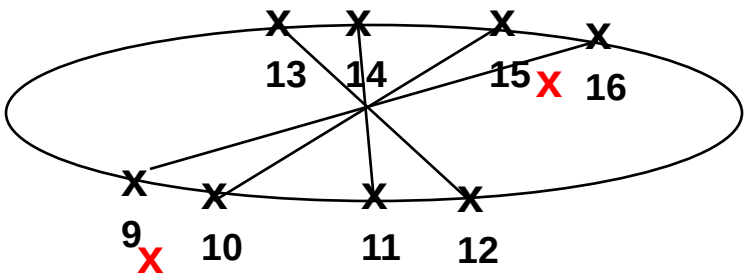
6 : reference source point found by the search

Bicubic interpolation: gaussian reduced grid case 2

rotation of latitudes

Rene reordered the neighbours, but in fact it was not necessary but we kept it

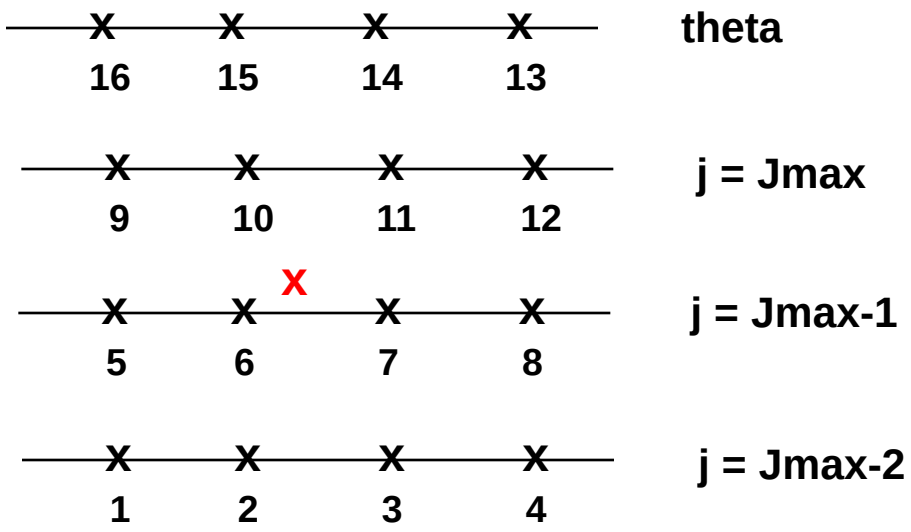
13 is shifted by ~180 deg towards 12
14 is shifted by ~180 deg towards 11
15 is shifted by ~180 deg towards 10
16 is shifted by ~180 deg towards 9



In this case, the latitudes are rotated of 90 degrees along each line above crossing the pole. The problem is wrong mathematically as the longitude of the target point is not in the range of longitudes of the neighbours 13 to 16 so we prescribe :

lon(13)=lon(12)
lon(14)=lon(11)
lon(15)=lon(10)
lon(16)=lon(9)

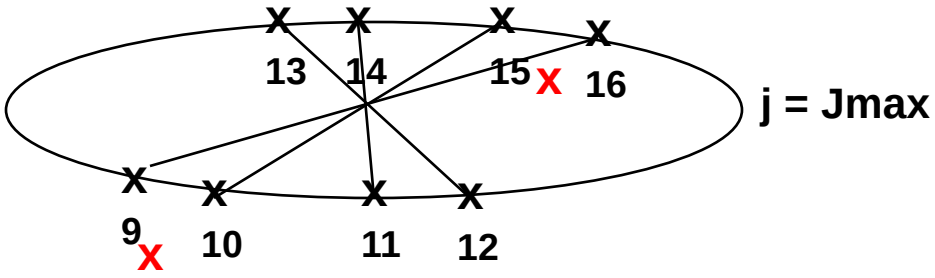
Finally we solve the system after rotation

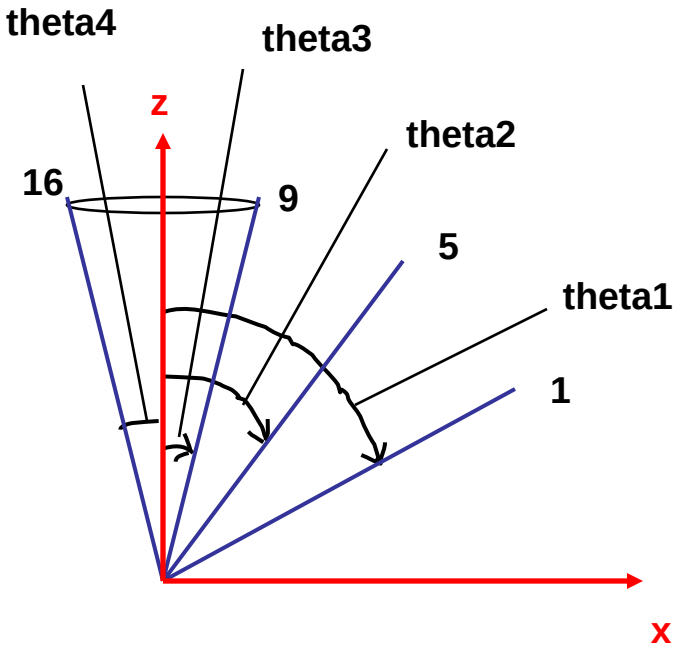


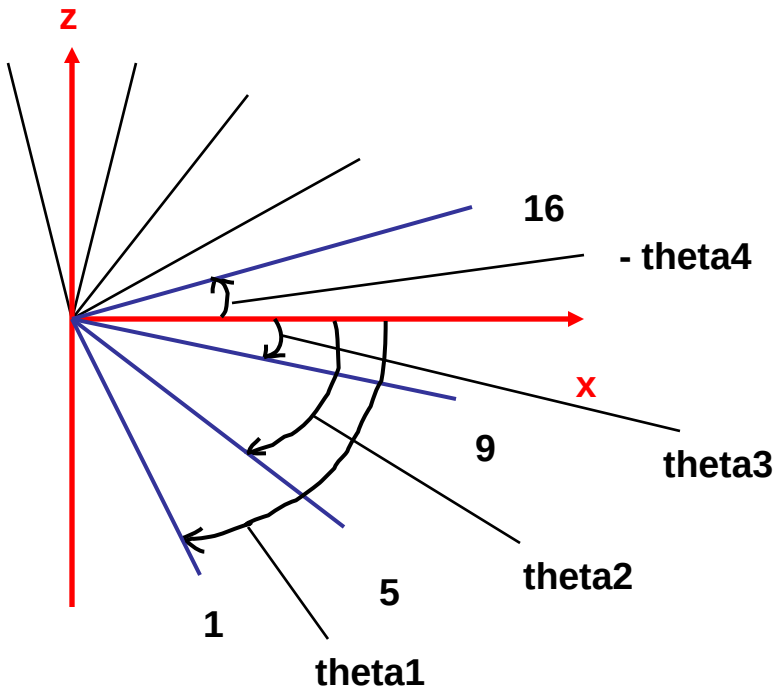
Bicubic interpolation: gaussian reduced grid case 2

rotation of latitudes : formulae of the transformation at the North pole

We consider the line 1-5-9-16 and the angles in spherical coordinates.
There are characterized by :
theta1 >0, theta2 >0, theta3 >0, theta4 = theta3.
Their angles after rotation of 90 degrees : theta1, theta2, theta3, -theta4 centered around Ox.

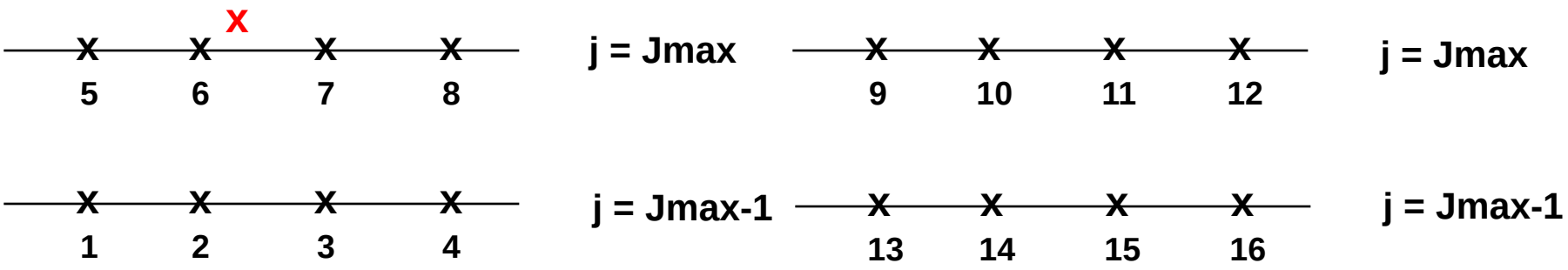






Bicubic interpolation: gaussian reduced grid

Case 3 : reference source point (6) found below on the left located on j = Jmax
→ Possible because last row close to the North pole



9 is shifted by ~180 deg towards 5
10 is shifted by ~180 deg towards 6
11 is shifted by ~180 deg towards 7
12 is shifted by ~180 deg towards 8

13 is shifted by ~180 deg towards 1
14 is shifted by ~180 deg towards 2
15 is shifted by ~180 deg towards 3
16 is shifted by ~180 deg towards 4

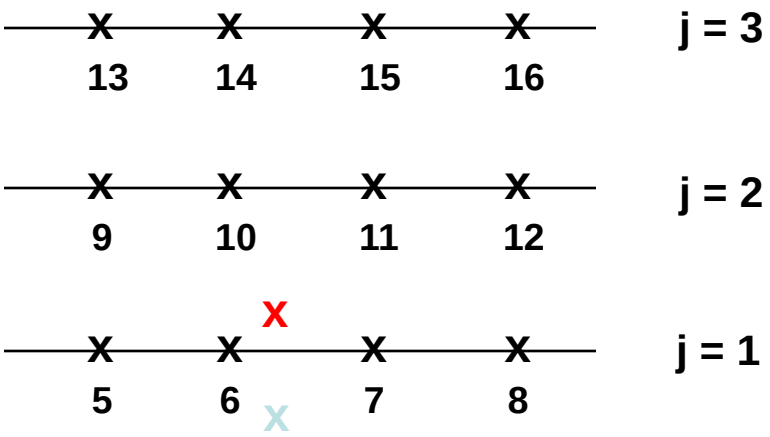
x : source points

x : target point

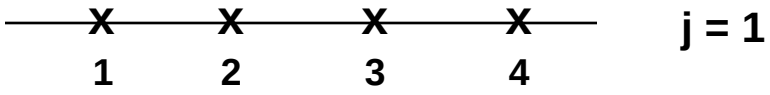
6 : reference source point found by the search

Bicubic interpolation: gaussian reduced grid

Case 4 : reference source point (6) found above on the left located on j = 1
→ Possible because first row close to the South pole



1 is shifted by ~180 deg towards 5
2 is shifted by ~180 deg towards 6
3 is shifted by ~180 deg towards 7
4 is shifted by ~180 deg towards 8



x : source points

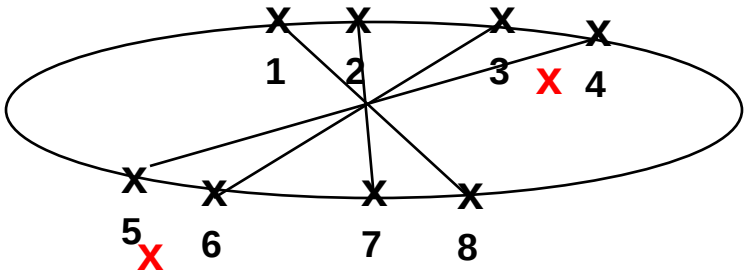
x, x : target points with same neighbours because il does not exist a point 6 for x

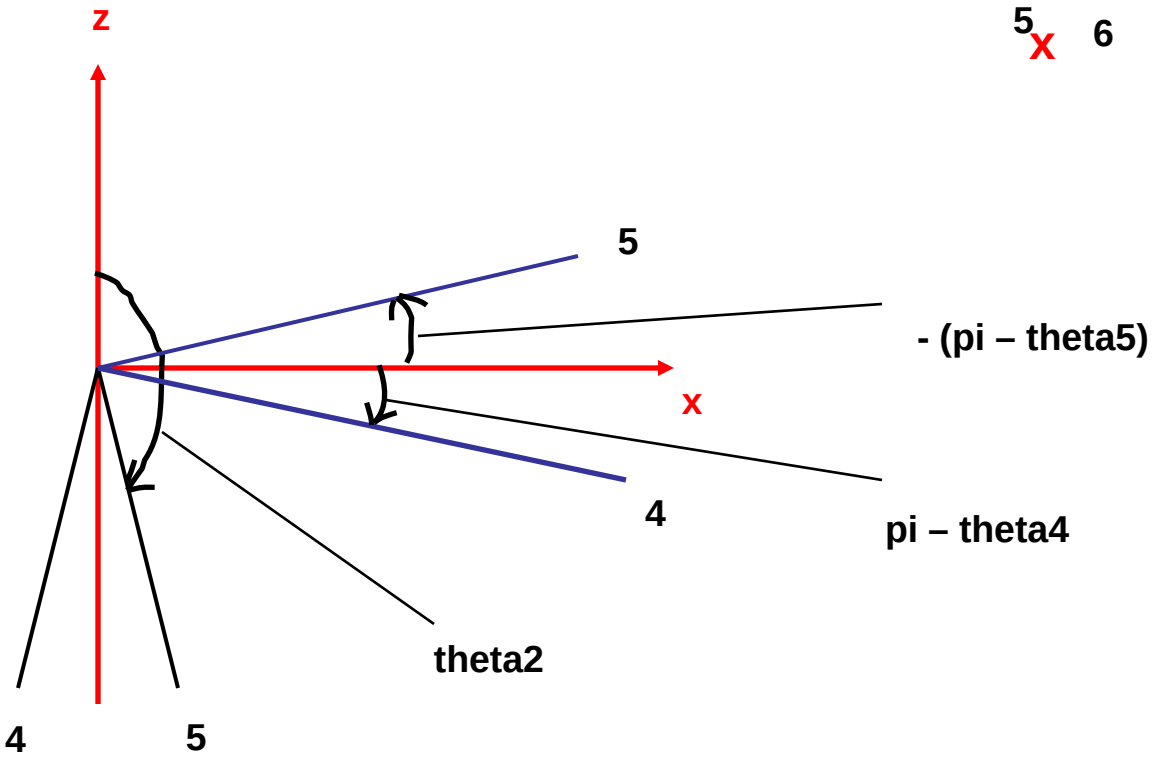
6 : reference source point found by the search

Bicubic interpolation: gaussian reduced grid case 4

rotation of latitudes : formulae of the transformation at the South pole

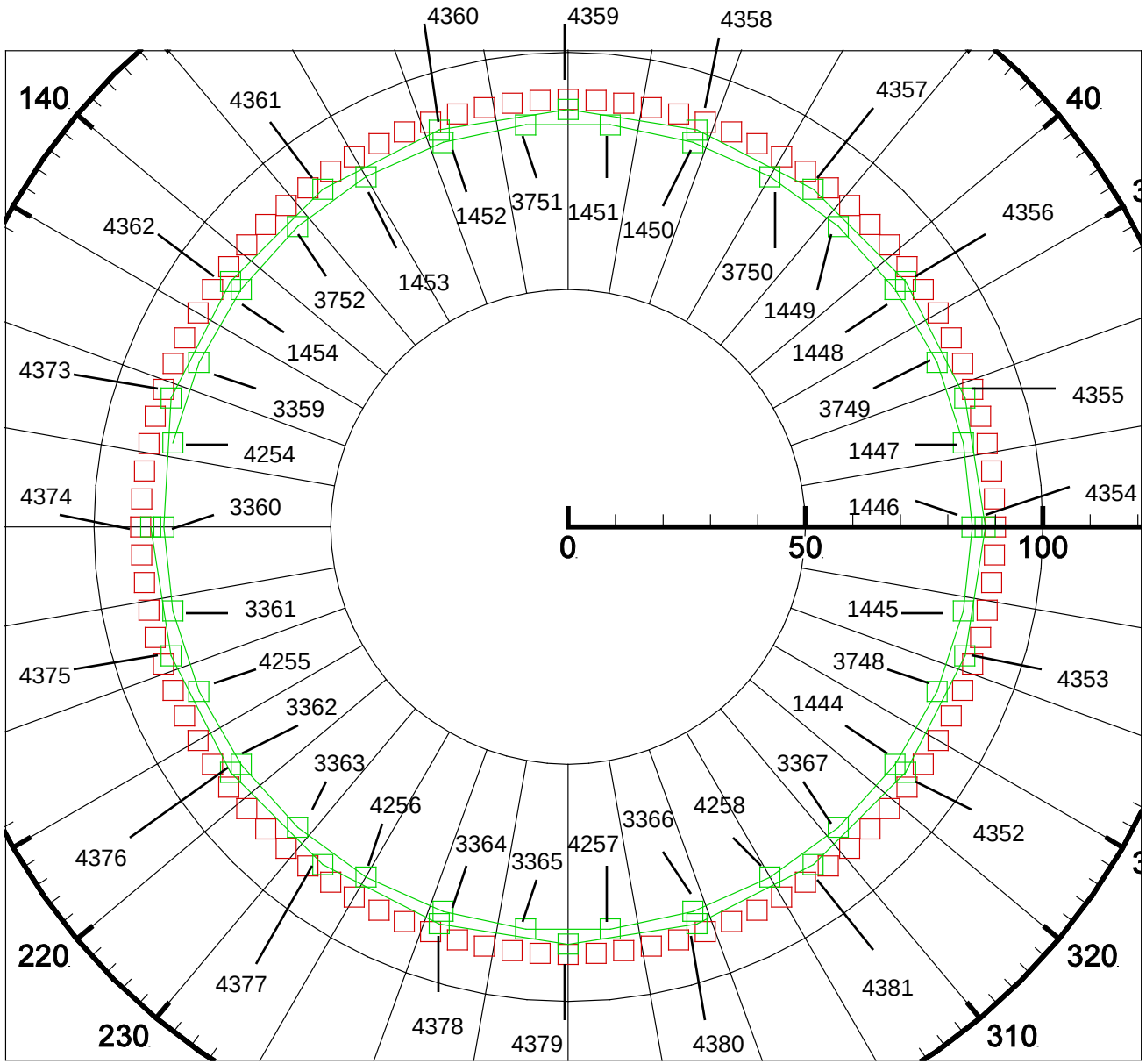
We consider the line 4-5-9-13 and the angles in spherical coordinates. There are characterized by : theta4 = theta5 >0, theta9 >0, theta13 >0.
At the South pole we have : pi – theta4, theta5 - pi, theta9 - pi, theta13 - pi, centered around (Ox)





BT42 to LMDz : bicubic interpolation on 1 processor

neighbours of the points j=72 at lat = 90 degrees



BT42 to LMDz : bicubic interpolation on 1 processor

neighbours of the points j=72 at lat = 90 degrees