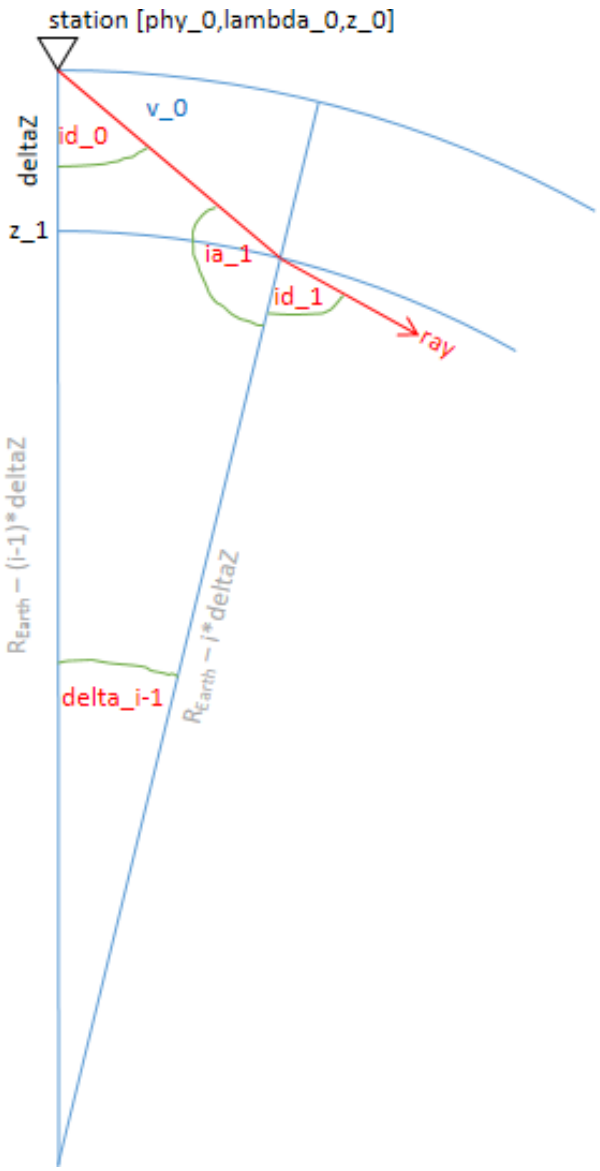
**Procedure for 3D migration of RFs in spherical coordinates for the AlpArray RF group** (version 6.7.2020. GH)

- select station
- select earthquake
- calculate back-azimuth at start baz_0 (ray will remain in plane but this will need to be updated at each step)
- calculate P wave ray parameter *p_0P*
- correct ray parameter *p* for P-to-S wave at assumed Moho (Leonardo's step)
- **migration itself**, from station [*phy_0, lambda_0, z_0+elev.*] downwards (loop on *_i*, *_i* being index of next level)
  - step down deltaZ from current *z_i-1* to next *z_i* (*_i=1* in the figure below)
  - use departing level's velocity, interpolated from 3D model (ideally: in that plane only) *v_i-1*
  - calculate departing incidence angle *id_i-1* from spherical ray param. def. $p = ( [R_{Earth} – (i-1) * deltaZ + elev ] * sin(id\_i-1) ) / v\_i-1$
  - calculate great-circle distance travelled *delta_i-1*
    - from sine law the arrival angle at layer _i is: $ia\_i = asin \{ sin(id\_i-1) / (R_{Earth} – i * deltaZ) * (R_{Earth} – (i-1) * deltaZ) \}$

      (NB: verify that $ia\_i > 90°$ !)
    - from simple triangle angle sum: $delta\_i-1 = 180° – id\_i-1 – ia\_i$
  - calculate new position [*phy_i, lambda_i*] using original position, *delta_i-1* and *baz_i-1*
  - update local back-azimuth *baz_i* for next step using [*phy_i, lambda_i*] and earthquake coordinates
- assign RF time samples to depth mesh
- stack, mean, etc. (as usual, using neighbouring cells)
- change representation to spherical (paraview?)

Below is a tentative sketch accompanying the text, top part refers to the step from level 0 to 1, the bottom part is generic (with index _i).


station [phy_0,lambda_0,z_0]
v_0
id_0
deltaZ
z_1
ia_1
id_1
ray
$R_{Earth} - (i-1)*deltaZ$
$R_{Earth} - j*deltaZ$
delta_i-1