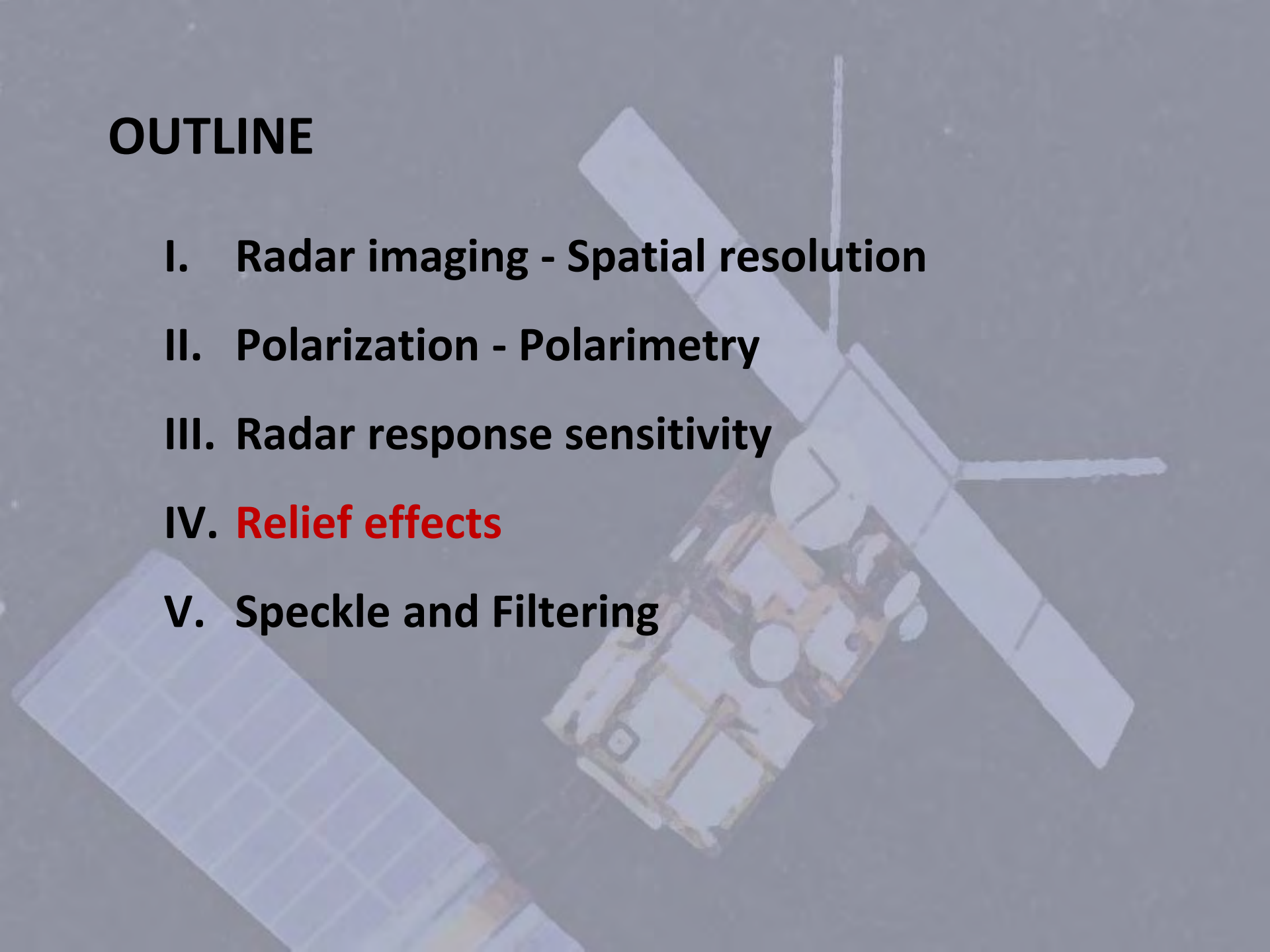


# OUTLINE

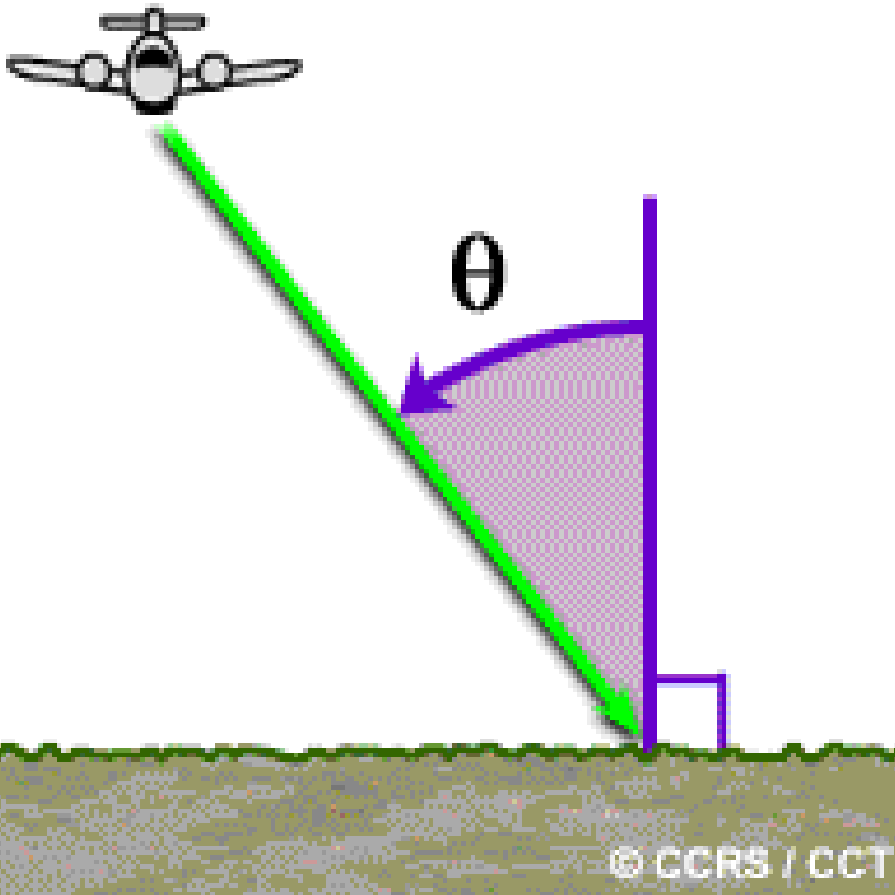
- I. Radar imaging - Spatial resolution
- II. Polarization - Polarimetry
- III. Radar response sensitivity
- IV. **Relief effects**
- V. Speckle and Filtering



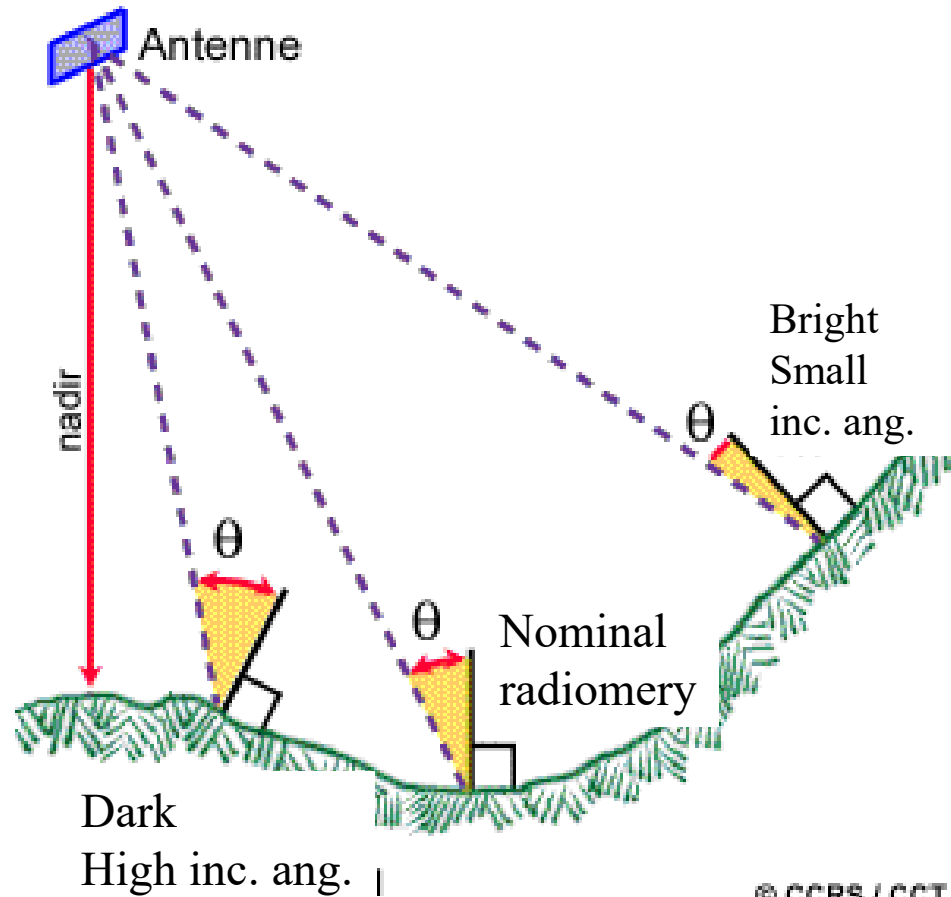
# Relief effects

## Acquisition incidence angle

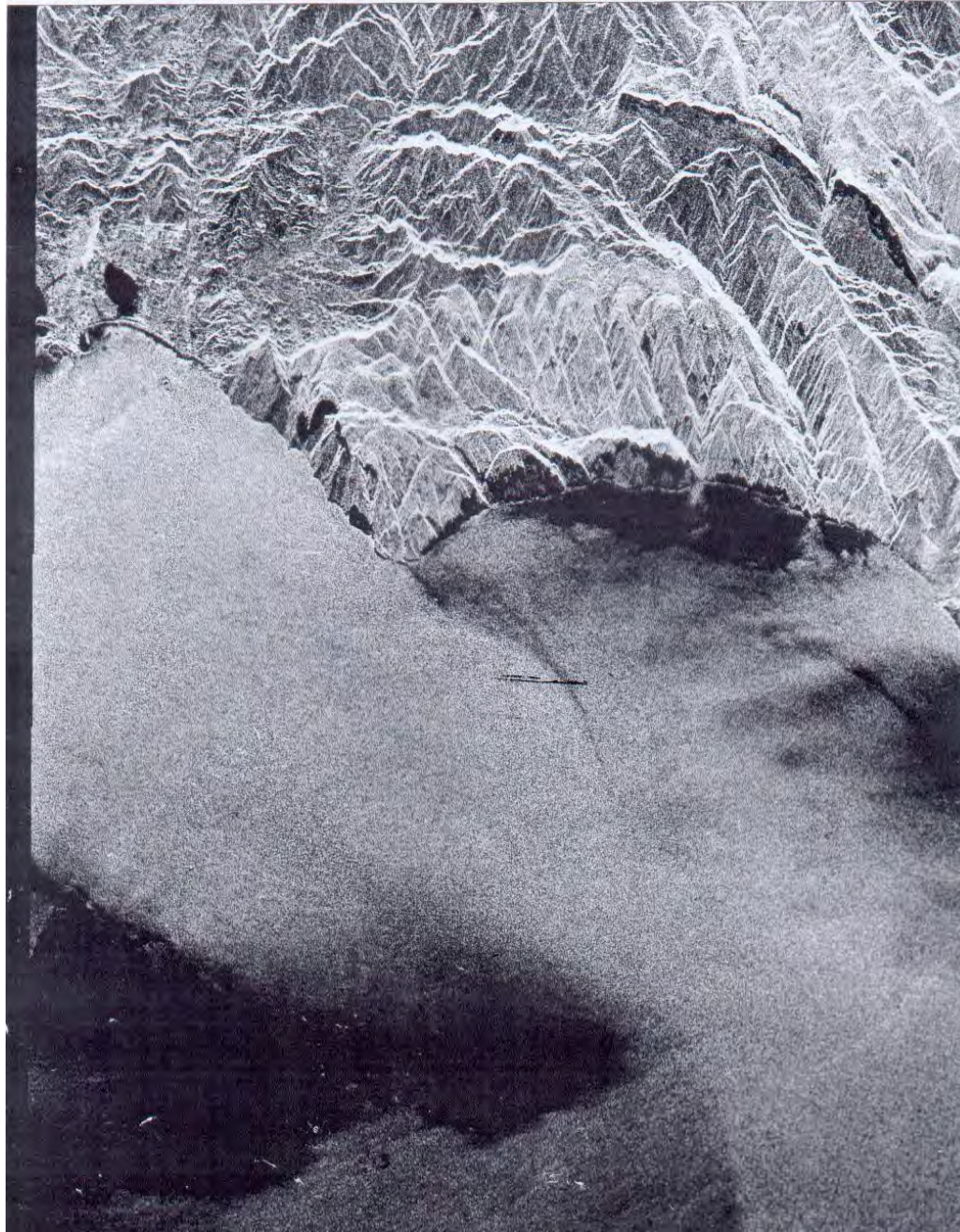
Incidence on flat terrain



Local incidence on relief



# Relief effects



# Relief effects

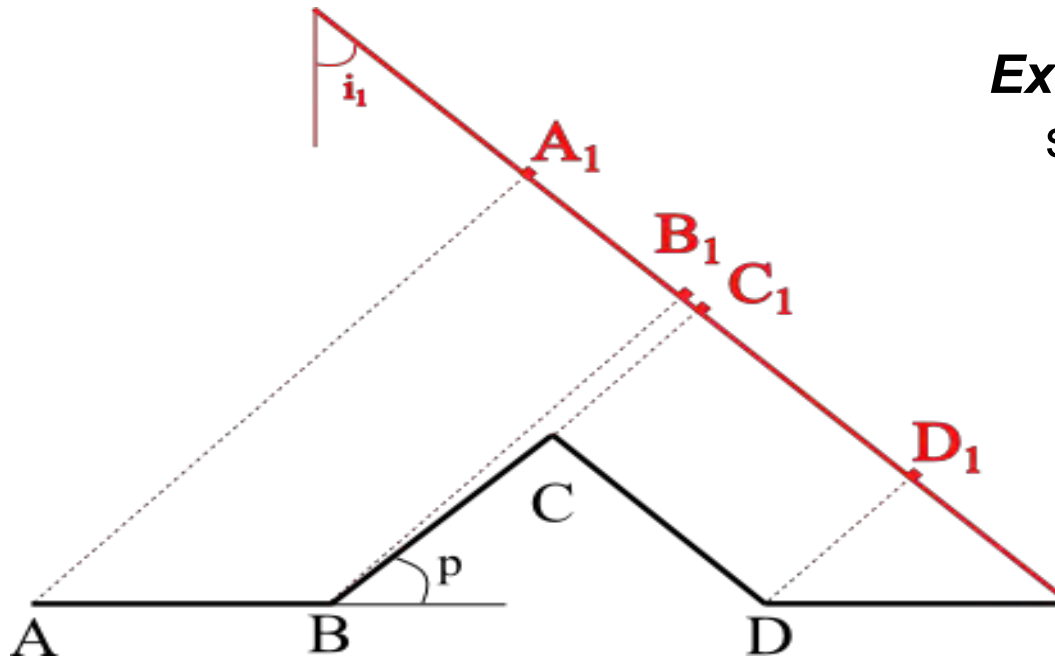
**Echoes are ranged according to  
Antenna – target distance**

***Foreshorting***

slopes facing the radar

***Extension***

slopes backward to the radar



# Relief effects

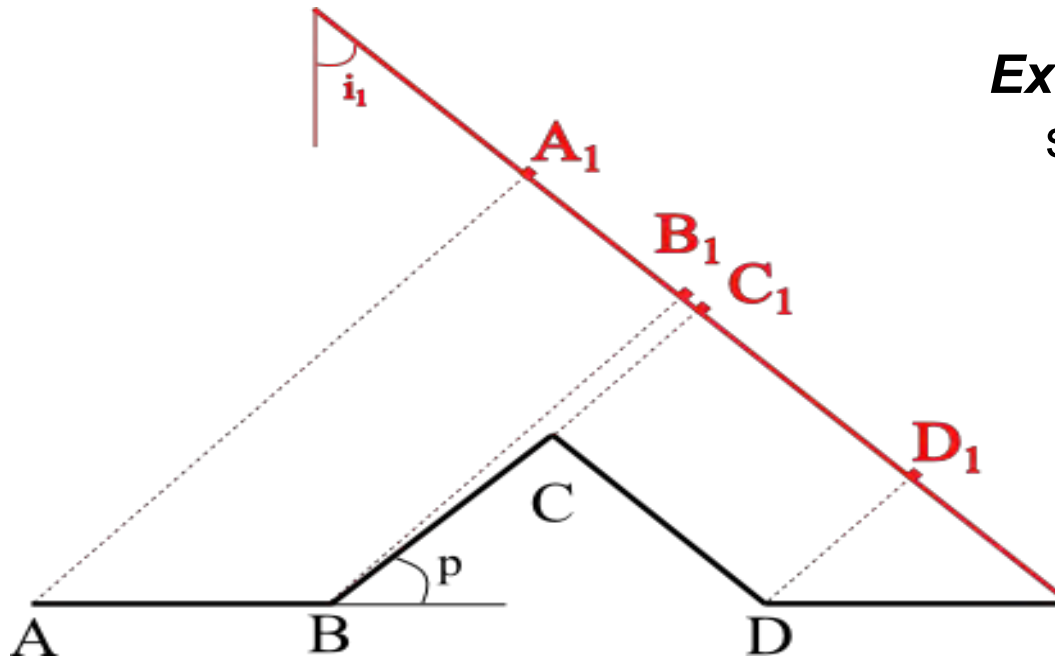
**Echoes are ranged according to  
Antenna – target distance**

***Foreshorting***

slopes facing the radar

***Extension***

slopes backward to the radar



$$A_1B_1 = AB \sin(i_1)$$

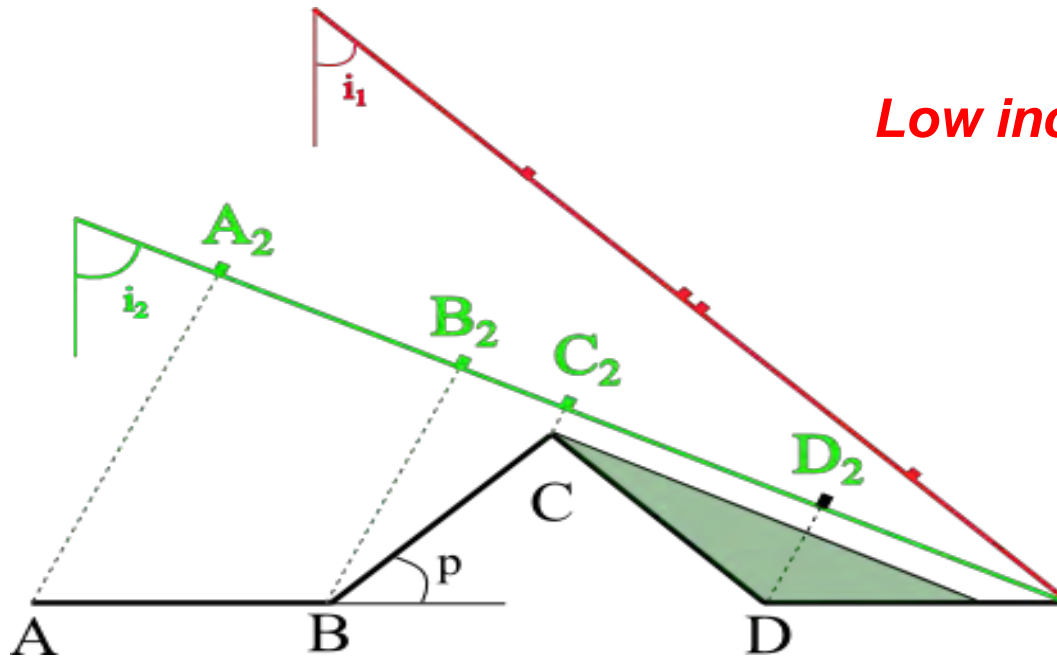
$$B_1C_1 = BC \sin(i_1 - p);$$

$$C_1D_1 = CD \sin(i_1 + p)$$



# Relief effects

Echoes are **ranged** according to  
**Antenna – target distance**



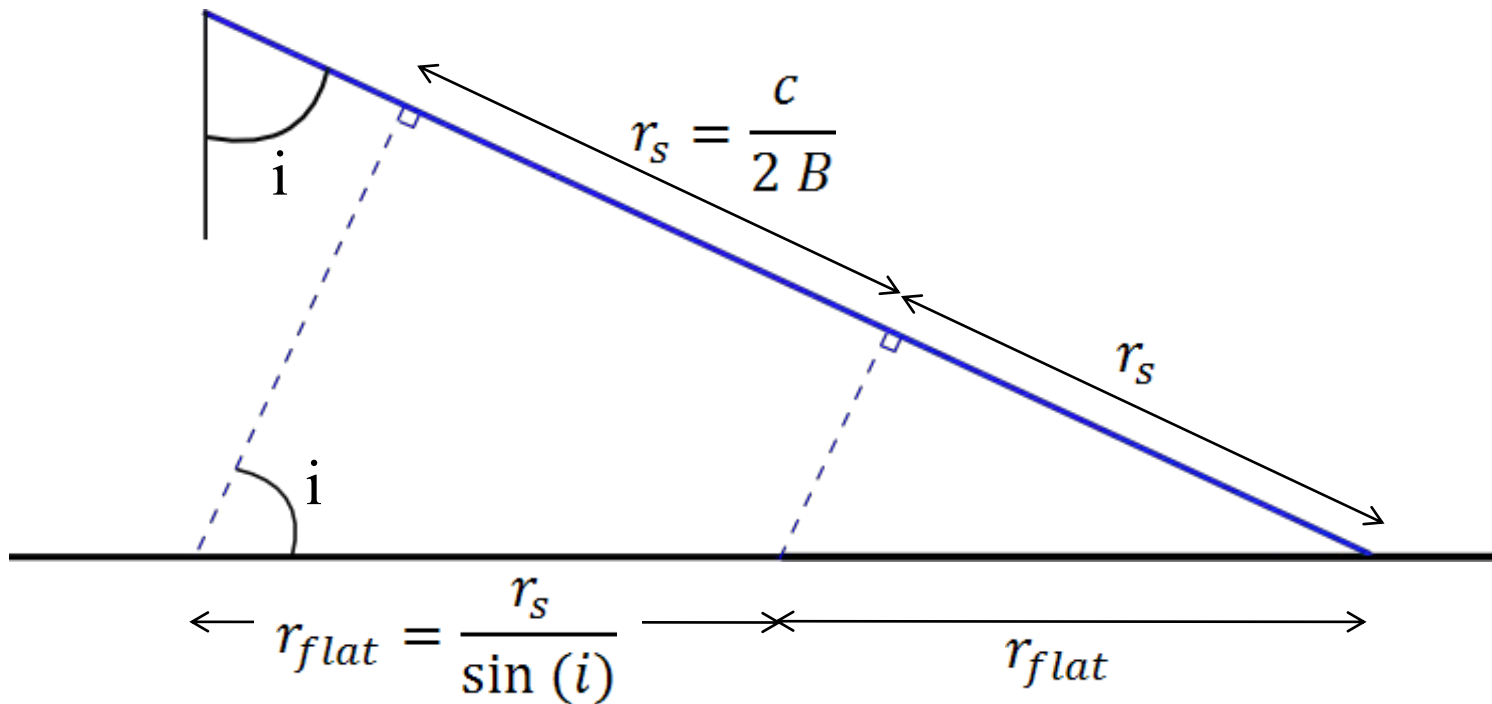
***Low incidences angle***

high geometrical distortions  
few shadows

***High incidence angle***

low geometrical distortions  
lot of shadows

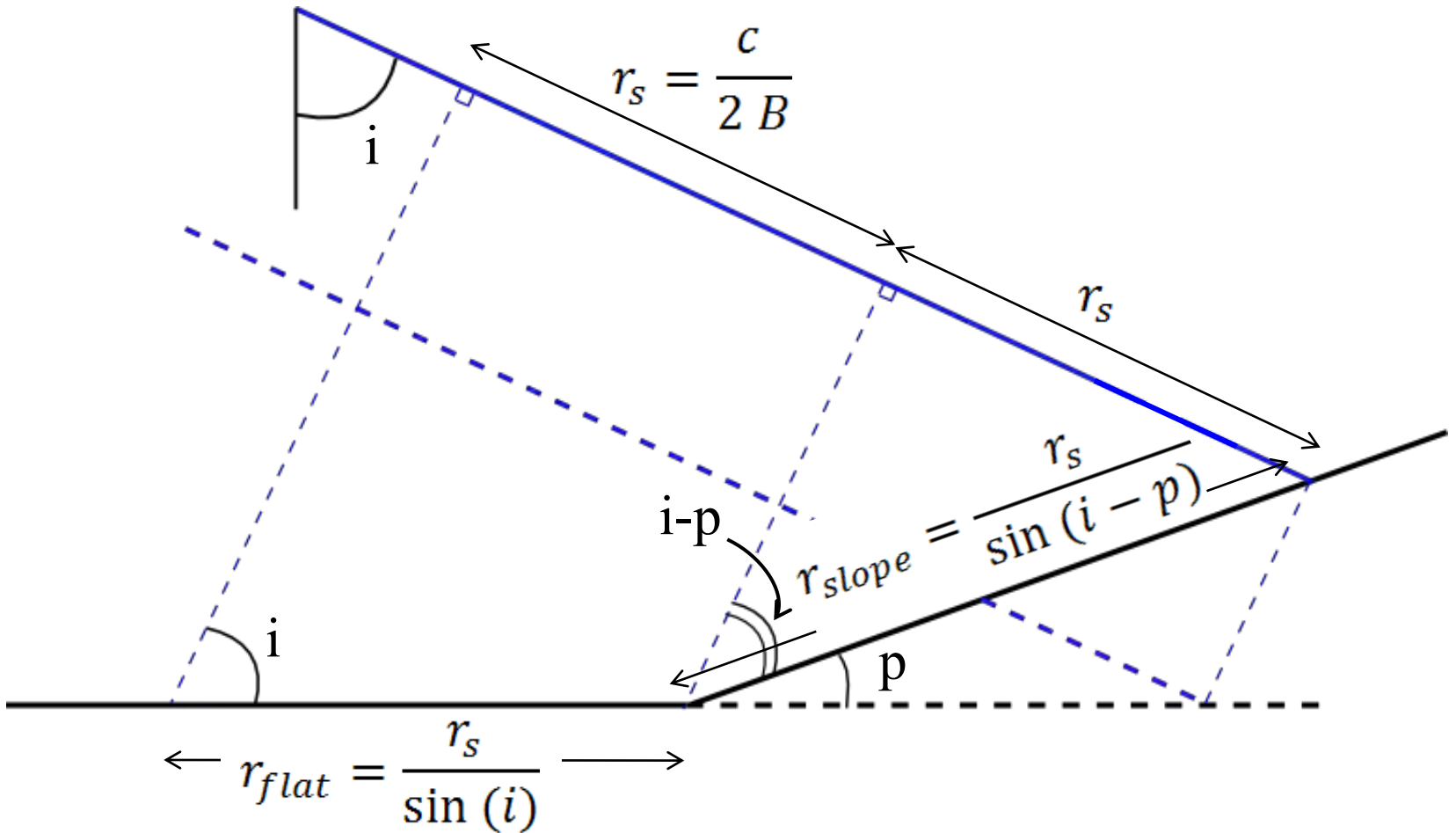
## *Range resolution*



# Relief effects

## *Range resolution*

$$r_{\text{slope}} = r_{\text{flat}} \frac{\sin(i)}{\sin(i-p)}$$

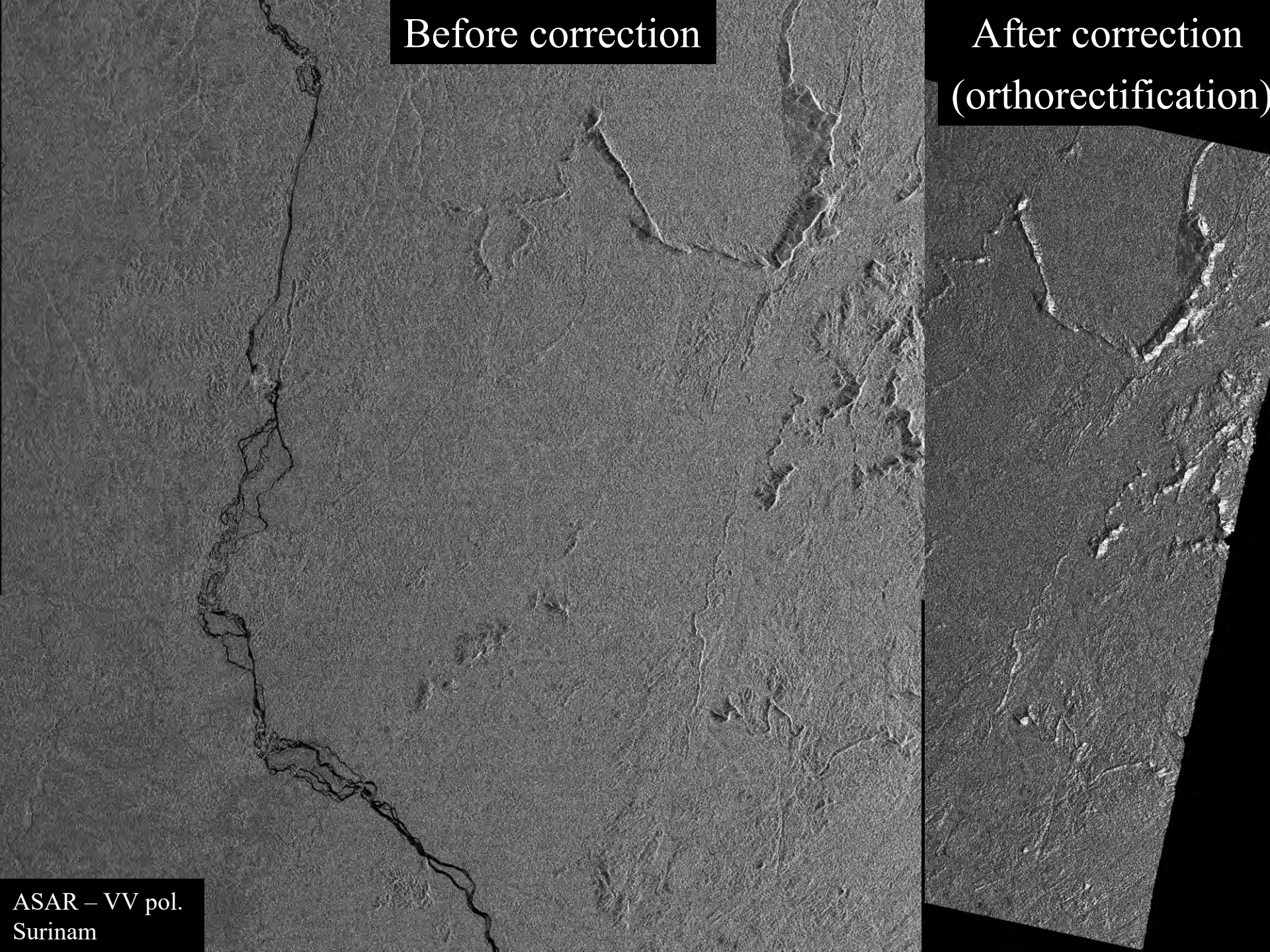




Before correction

After correction  
(orthorectification)

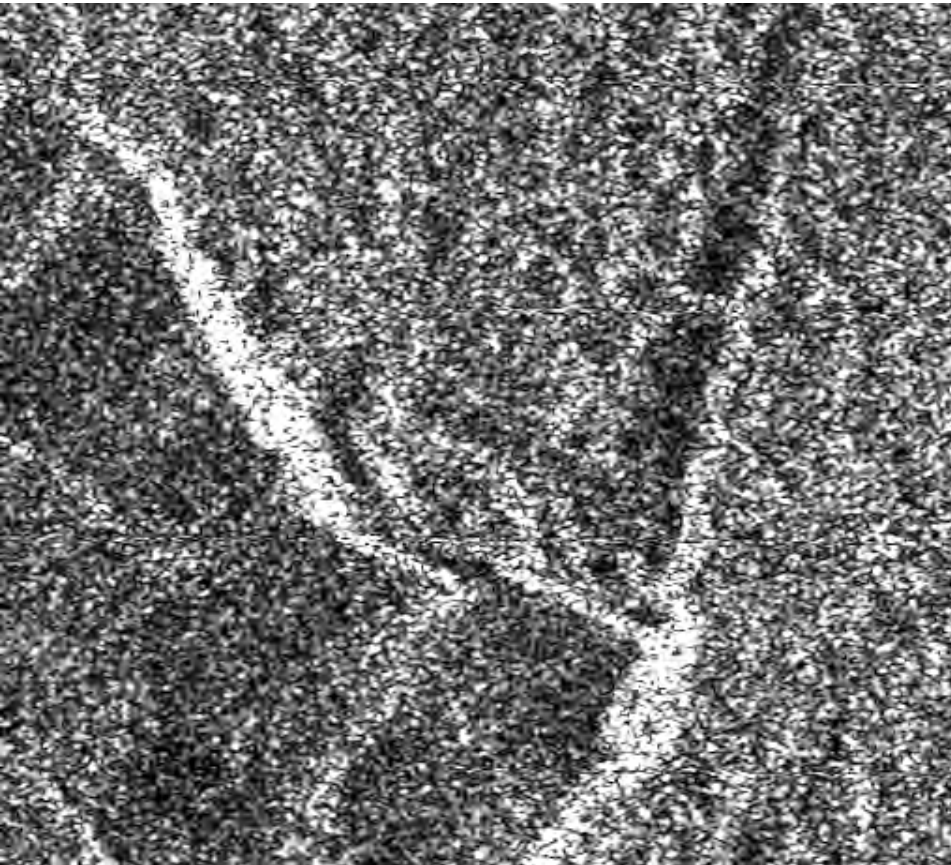
ASAR – VV pol.  
Surinam



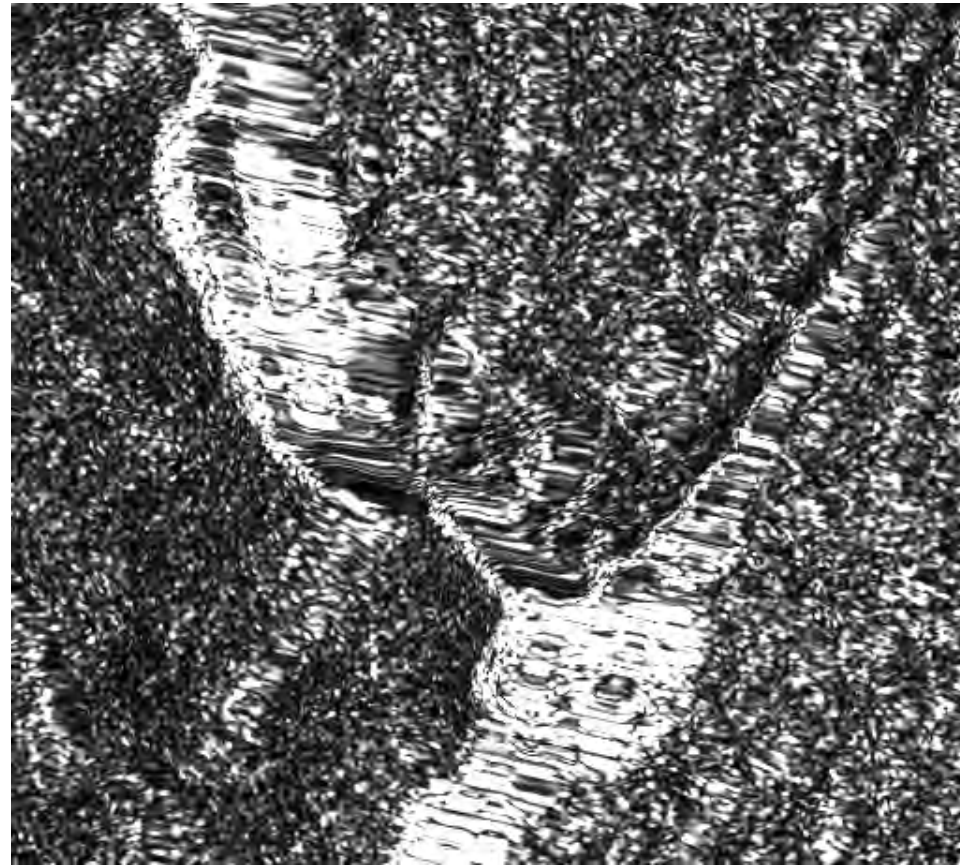


# Relief effects

Before correction



After correction  
(Orthorectification)



# TAKE HOME MESSAGE

Due to side looking geometry, radar more sensitive to relief than optical dat (nadir view)

***Foreshorting:*** slopes facing the radar

***extension:*** slopes backward to the radar

## ***Ortho-rectification***

geometrical correction (foreshorting, extension)

no radiometrical correction (due to  $\sigma^0$  angular signature)

👉 recommendation: mask high slopes values ( $> 20^\circ$ )