## Exercise 1: Step 8 - Slope correction

### **Radar backscatter: Ellipsoid-normalisation**

### Conventional Radar Backscatter

• Backscatter coefficients [dB/m<sup>2</sup>] are ratio of scattered to incident power per unit area:

$$\beta = k \cdot \frac{P_s}{P_i} \qquad \beta^0 = \frac{\beta}{A_\beta} \quad \sigma_E^0 = \frac{\beta}{\underline{A}_\sigma} \quad \gamma_E^0 = \frac{\beta}{\underline{A}_\gamma}$$

- Known: transmitted & received power  $P_t \& P_r$
- <u>Derive</u>: incident & scattered power  $P_i \& P_s$ from  $P_t \& P_r$

$$\beta^{0} = k \cdot \frac{f_{2}(P_{r})}{f_{1}(P_{t})} \cdot \frac{1}{A_{\beta}} \qquad \sigma_{E}^{0} = k \cdot \frac{f_{2}(P_{r})}{f_{1}(P_{t})} \cdot \frac{1}{\underline{A}_{\sigma}} \qquad \gamma_{E}^{0} = k \cdot \frac{f_{2}(P_{r})}{f_{1}(P_{t})} \cdot \frac{1}{\underline{A}_{\gamma}}$$

David Small (RSL UZH) - QWG ESRIN 2009.10.27-28

Ellipsoid-normalisation ASAR: Calibrated sigma nought for detected products can be derived as:







# Exercise 1: Step 8 - Slope correction (Kellndorfer) - VV

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Product Explorer X Pixel Info Product Schorer X Pixel Info Program Convert Band Propagate Unce Geo-Coding Disg		
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← ■ sigmaj_v     ← ■ sigmaj_v     ← ■ sigmaj_v     ← ■ sigmaj_v     ← ■ Metadata     ← ■ Vector Data     ← ■ Sigma b VM		2. Name: Sigma0_VV_Norm
Sigma0_W projectedLocalincidenceAngle incidenceAngleFromEllipsoid		3. Description: Intensity
Band Maths		4. Click Edit Expression (see next slide)
Target product:		(insert the expression)
[4] S1A_IW_GRDH_1SDV_20150527T061437_20150527T061502_0061	03_007EAA_875A_Orb_Noise-Cor_Cal_ML2_Spk_TC	
Name: Sigma0_VV_Norm		5. Click ok
Unit		
Spectral wavelength: 0.0		
Virtual (save expression only, don't store data)		
Replace NaN and infinity results by	NaN	
Generate associated uncertainty band		
(Sigma0_VV * sin(PI*projectedLocalIncidenceAngle/180)) / sin(PI* incidenceAngle/180))	denceAngleFromEllipsoid/180)	
Load Save	Edit Expression	
		X Y Lat Lon Zoom Level
	OK Cancel Help	
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# Exercise 1: Step 8 - Slope correction (Kellndorfer) - VV

🙆 Band Maths Expression I	Editor	
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# Exercise 1: Step 8 - Slope correction (Kellndorfer) - VH

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	Metadata     Export     Vector Data     Signad VH			2. Name: Sigma0_VH_Norm		
	Sigma0_VV     projectedLocalIncidenceAngle     incidenceAngleFromEllipsoid			3. Description: Intensity		
Band Maths			_	4. Click Edit Expression (see next slide)		
Target product				(insert the expression)		
[4] S1A_IW_GRDH_15	DV_20150527T061437_20150527T061502_0061	03_007EAA_875A_Orb_Noise-Cor_Cal_ML2_Spk_TC	-	(Insert the expression)		
Name:	Sigma0_ <b>VIH_</b> Norm			5 Click ok		
Description:	Intensity					
Spectral wavelength:	0.0					
🔲 Virtual (save expr	ression only, don't store data)					
Replace NaN and	infinity results by		NaN			
Generate associa	ated uncertainty band					
(Sigma0_VV * sin(PI*	ion: projectedLocalIncidenceAngle/180)) / sin(PI* inci	denceAngleFromEllipsoid/180)				
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# Exercise 1: Step 8 - Slope correction (Kellndorfer) - VH

🙆 Band Maths Expression I	Editor		
Data sources: Sigma0_VH Sigma0_VV projectedLocalIncidenceAngle incidenceAngleFromEllipsoid Show bands Show masks Show the-point grids Show single flags	@ + @ @ - @ @ * @ @ / @	Expression: (SigmaO_VH * sin(PI*projectedLocalIncidenceAngle/180)) / sin(PI* incidenceAngleFromEllipsoid/180)	
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