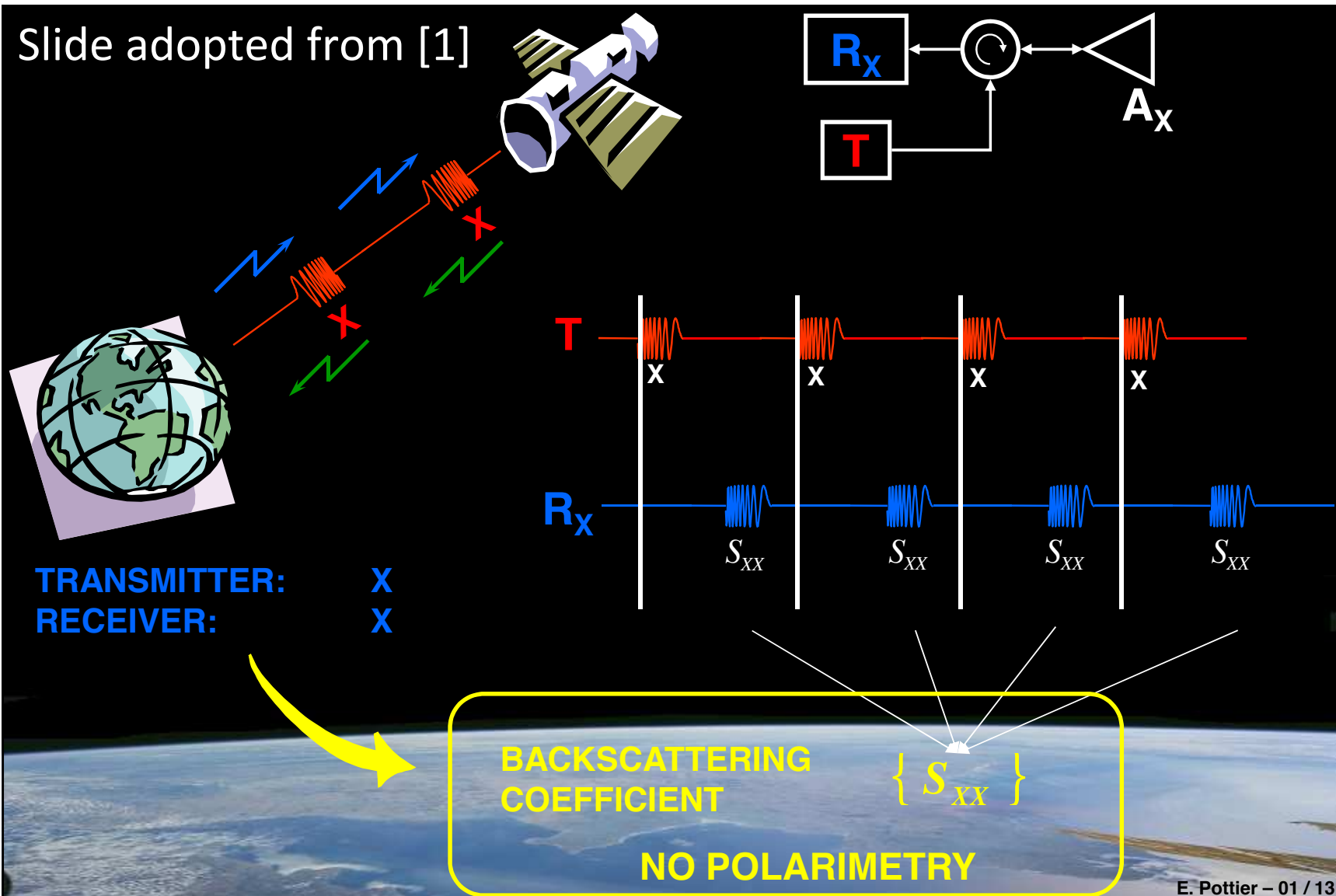


# Single-pol radars

Slide adopted from [1]

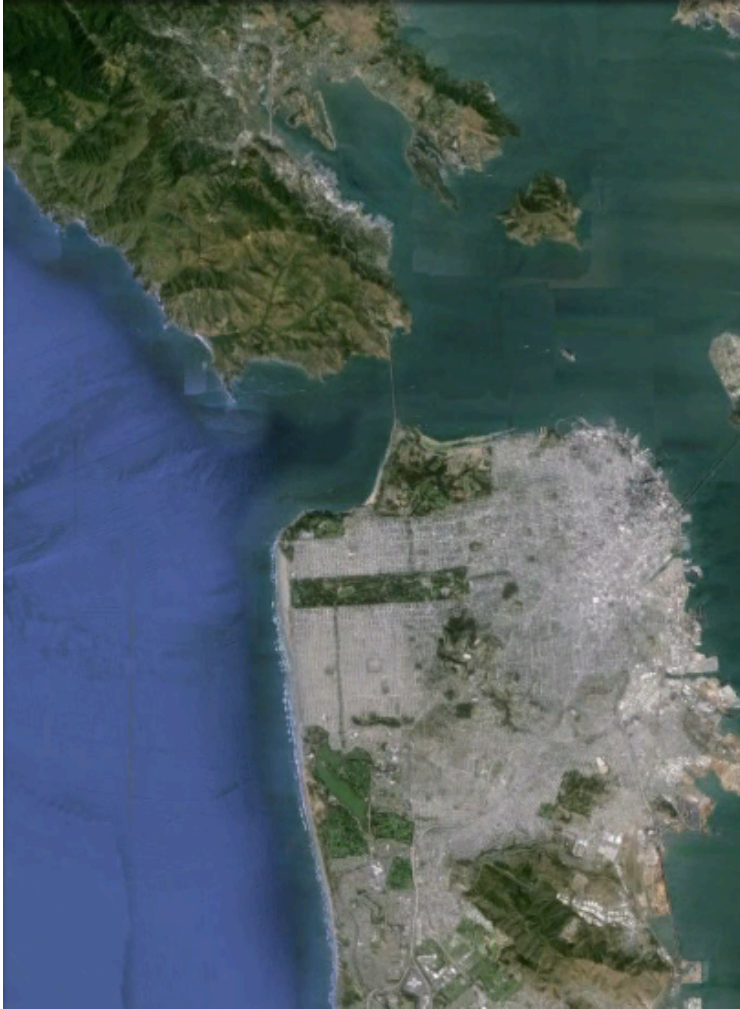


E. Pottier – 01 / 13



# SAR: Backscattering coefficient

**SAN FRANCISCO BAY**



**HH (dB)**

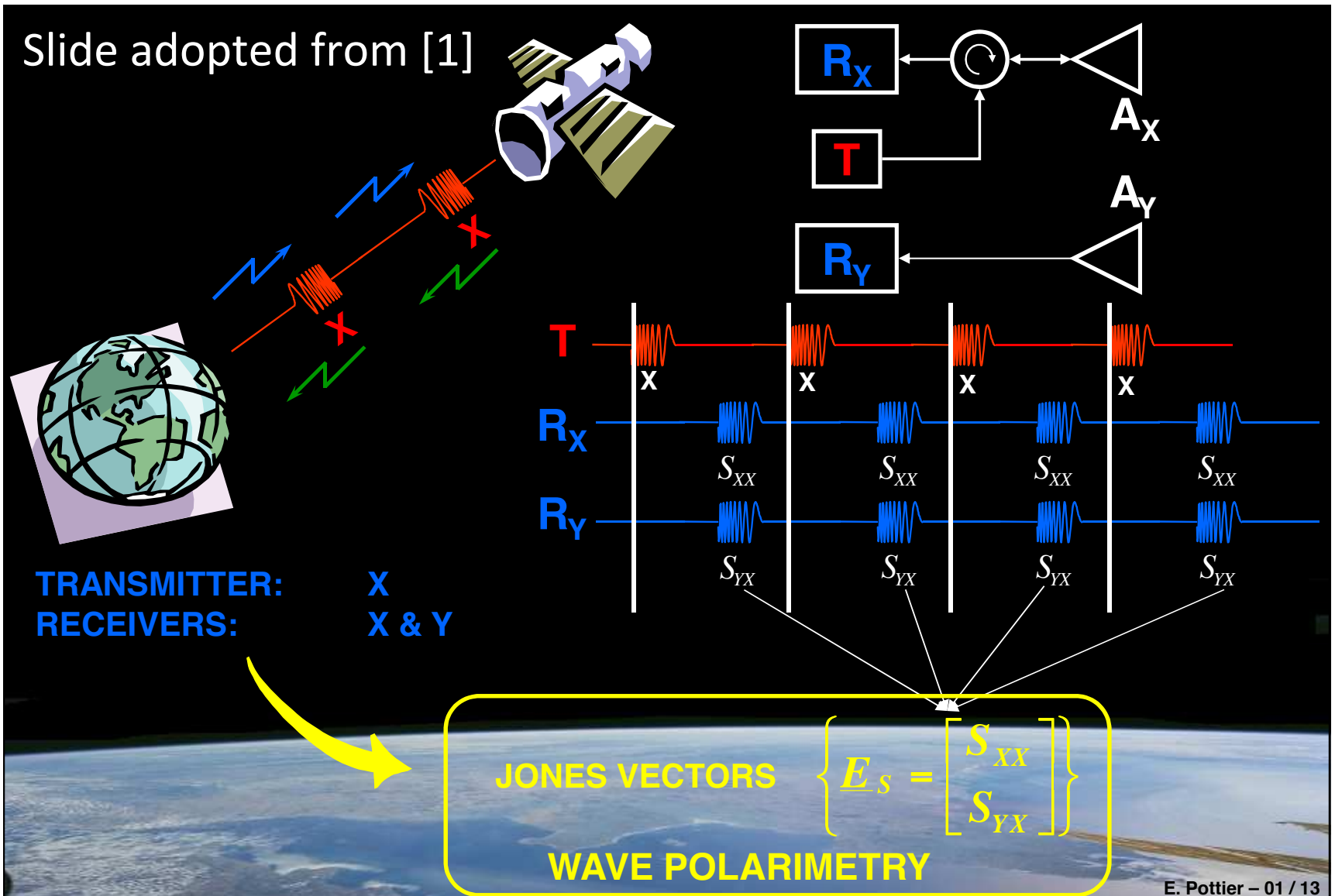


**ALOS-PALSAR IMAGE**



# Dual-pol radars

Slide adopted from [1]



E. Pottier – 01 / 13



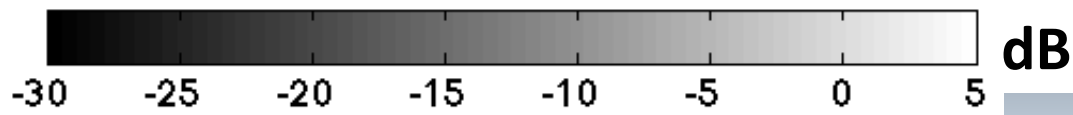


# Dual-pol SAR measurements

HH (dB)



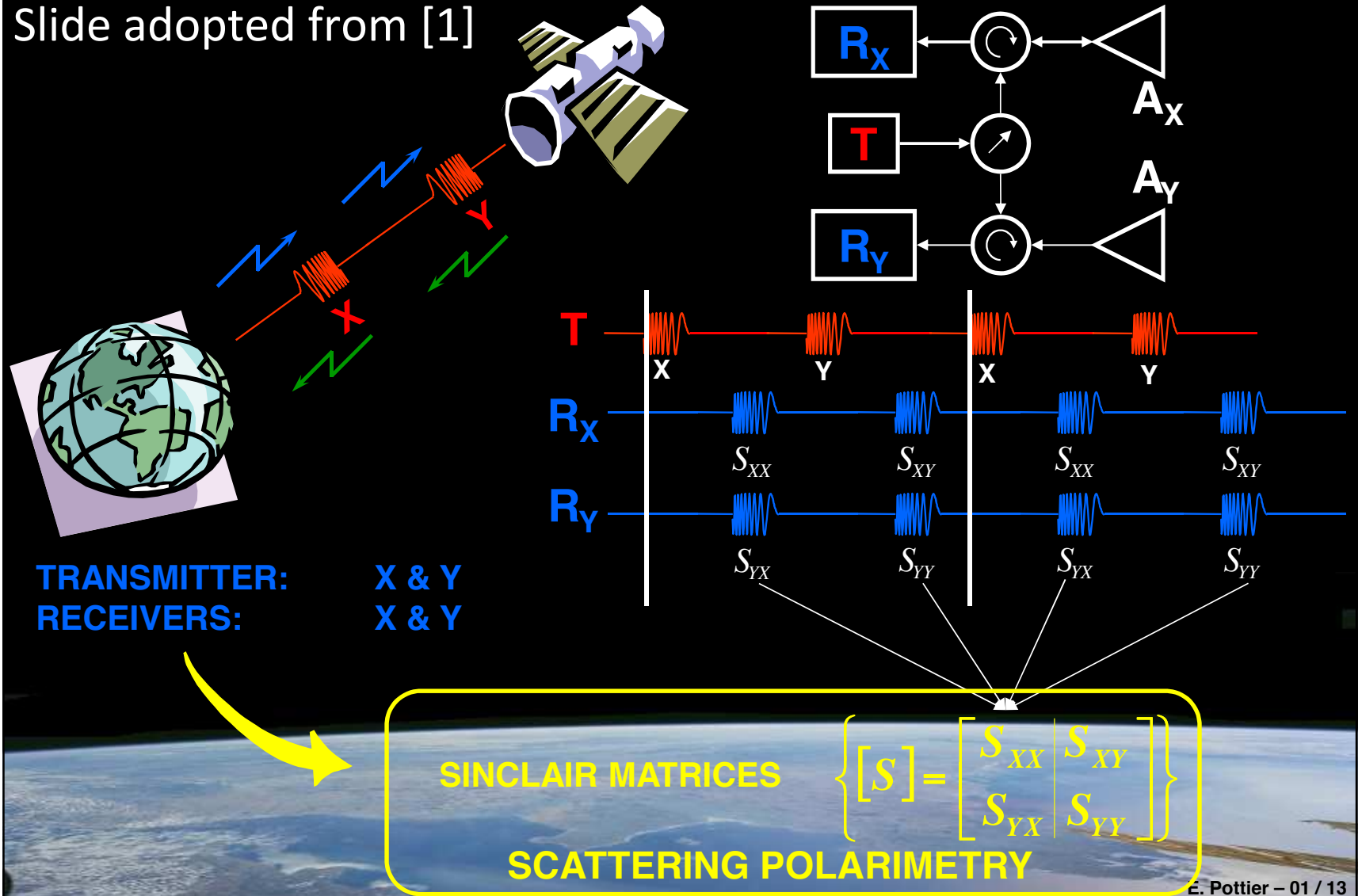
HV (dB)





# Quad-pol radars

Slide adopted from [1]



# Quad-pol SAR measurements

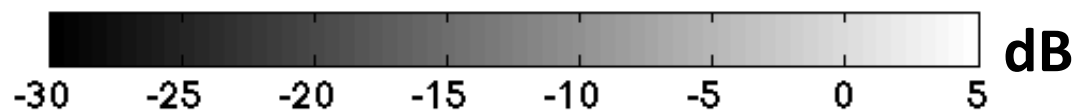
HH (dB)



HV (dB)



VV (dB)

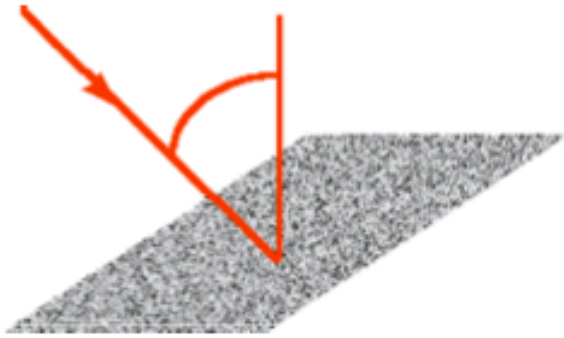




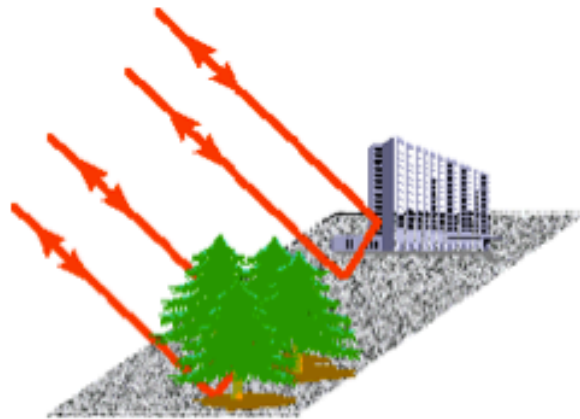
# Polarimetric coherency matrix **T**

Figure adopted from [1]

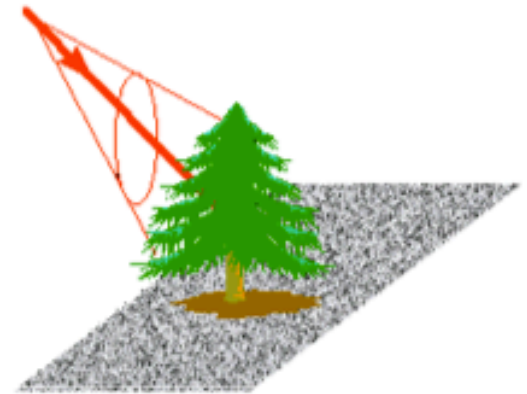
**SINGLE BOUNCE  
SCATTERING  
(ROUGH SURFACE)**



**DOUBLE BOUNCE  
SCATTERING**



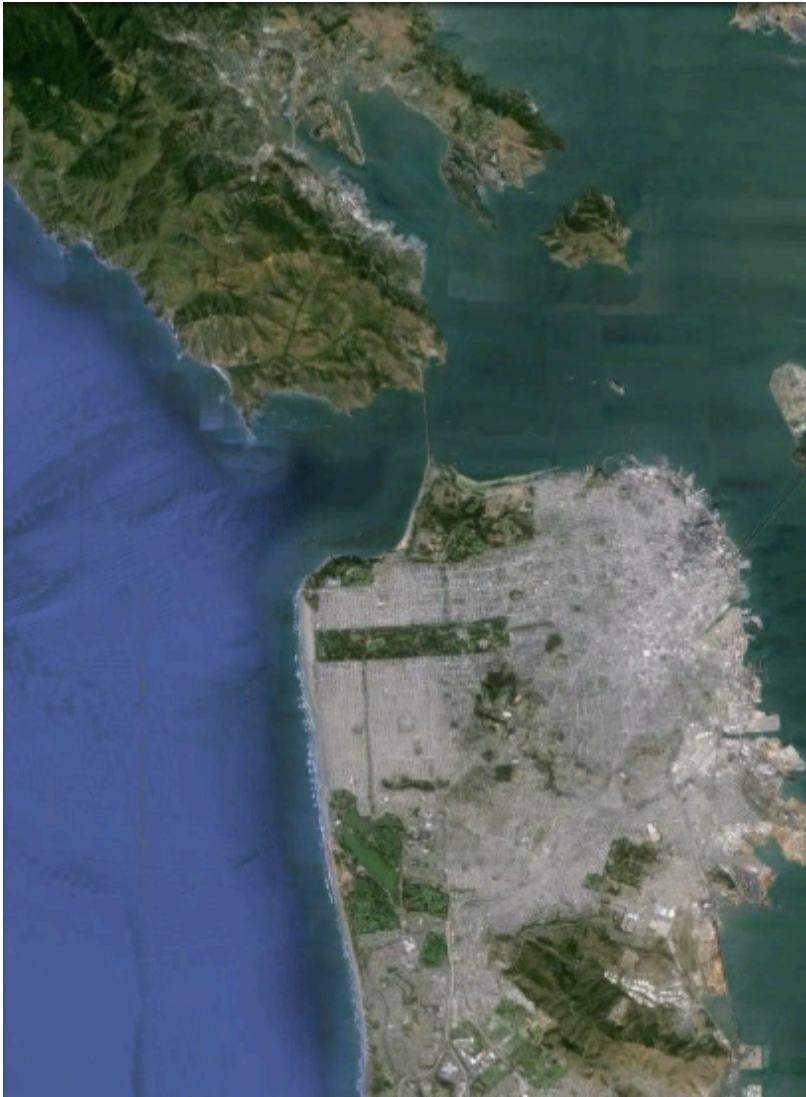
**VOLUME  
SCATTERING**



$$T_{11} = \left\langle |S_{XX} + S_{YY}|^2 \right\rangle \quad T_{22} = \left\langle |S_{XX} - S_{YY}|^2 \right\rangle \quad T_{33} = \left\langle |S_{XY}|^2 \right\rangle$$

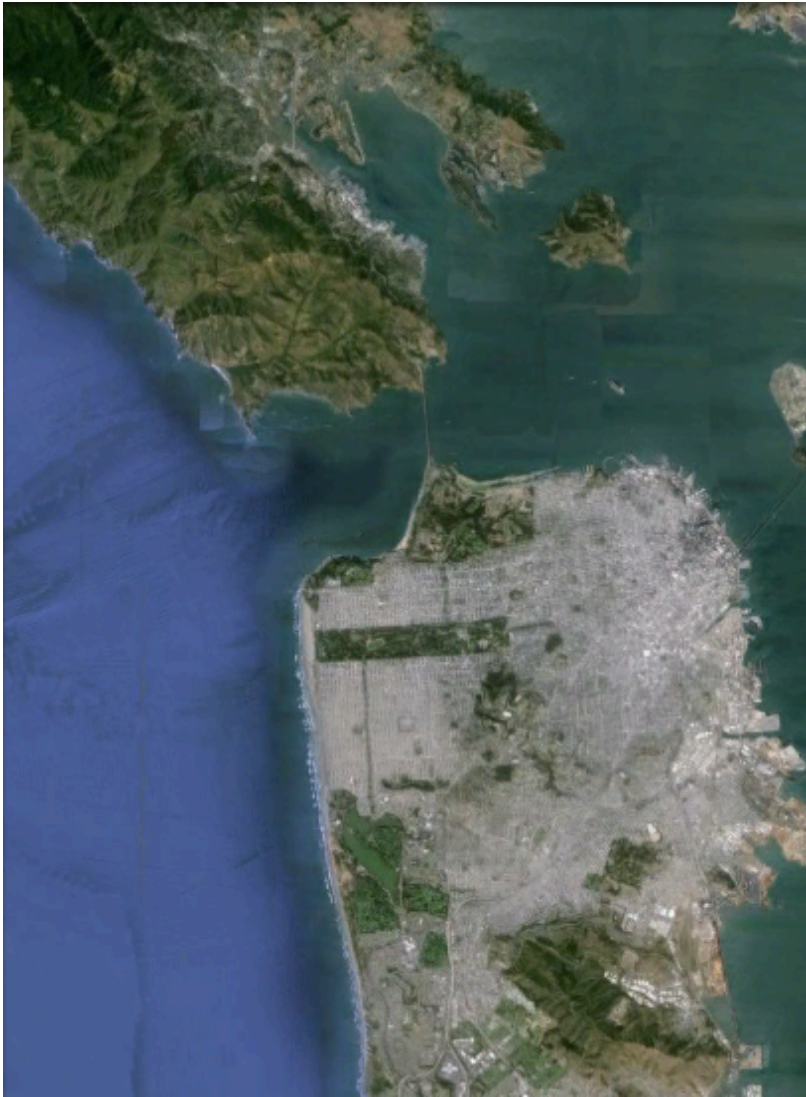
**T** allows to provide a better and direct physical interpretation of the scattering process

$$|VV|^2, |HV|^2, |HH|^2$$





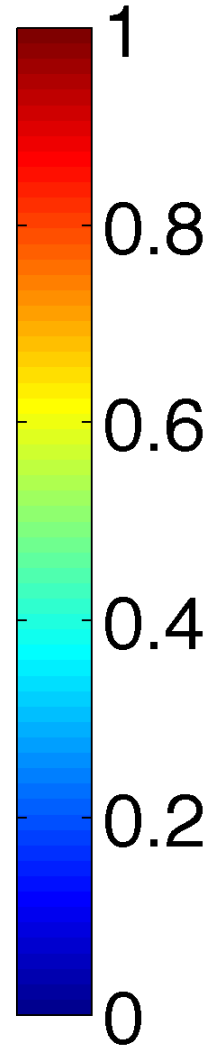
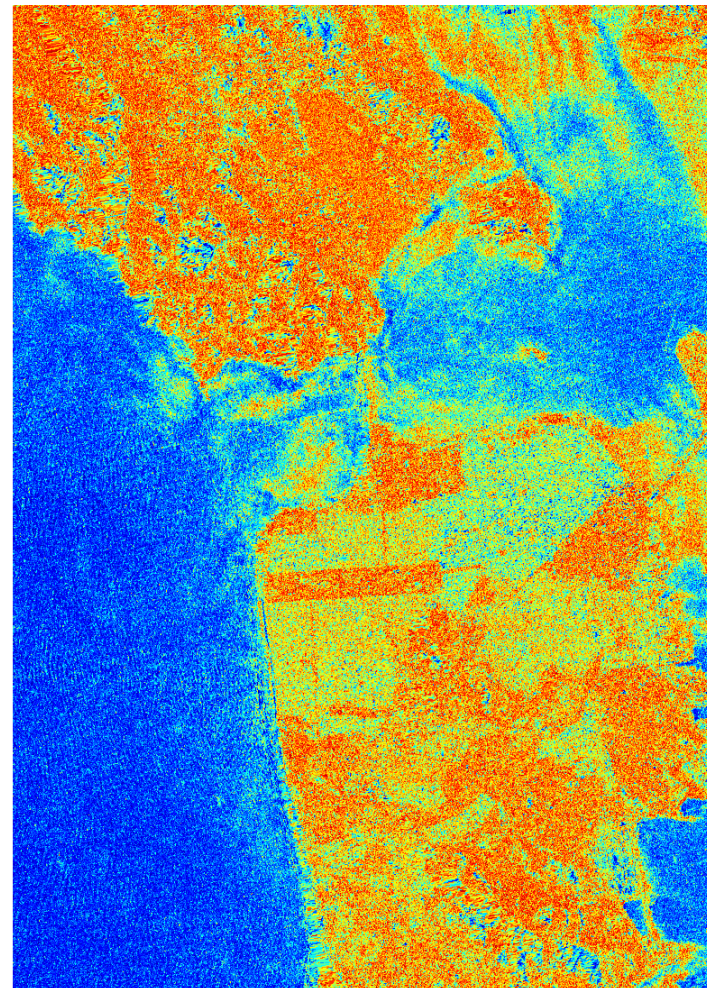
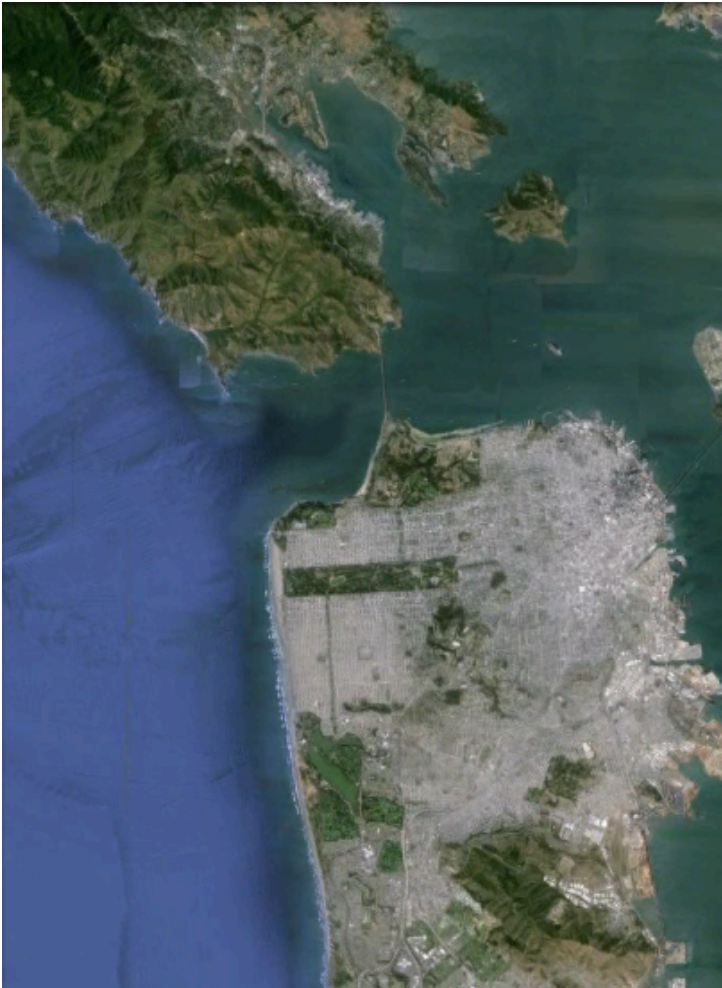
$$|HH-VV|^2, |HV|^2, |HH+VV|^2$$





# Entropy ( $H$ )

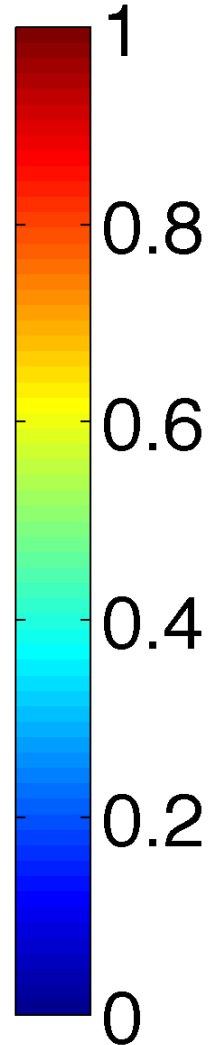
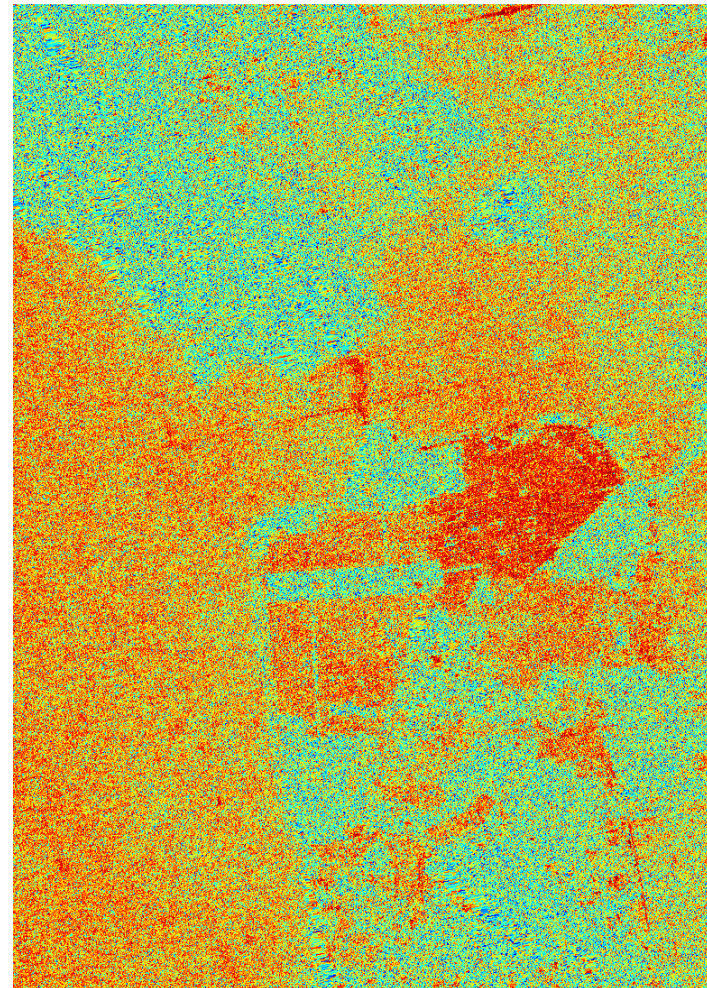
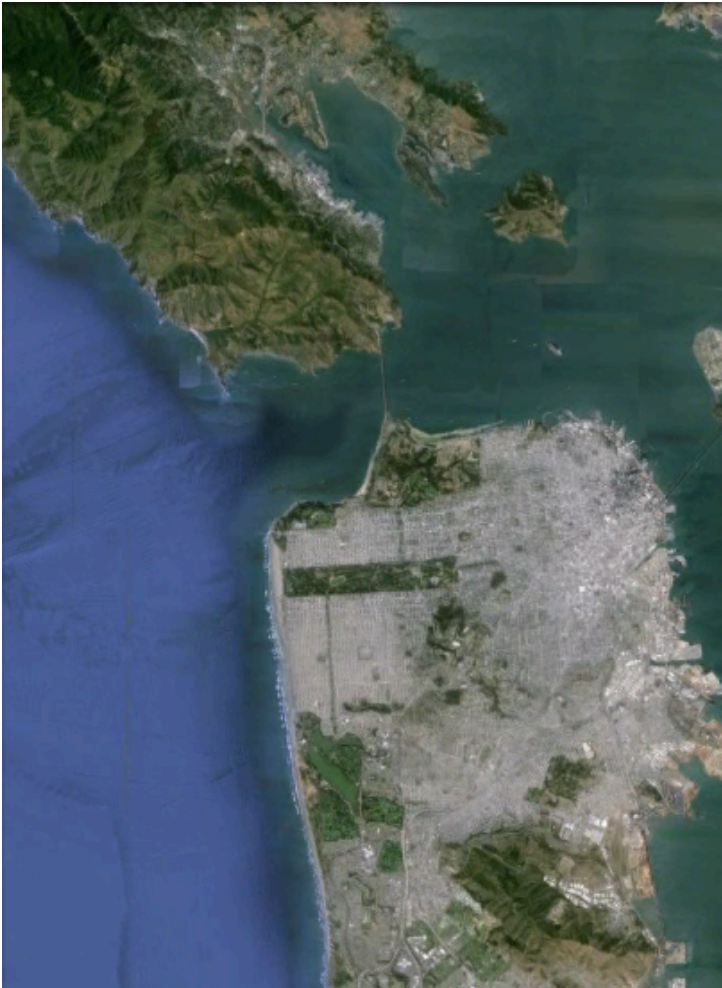
Entropy





# Anisotropy ( $A$ )

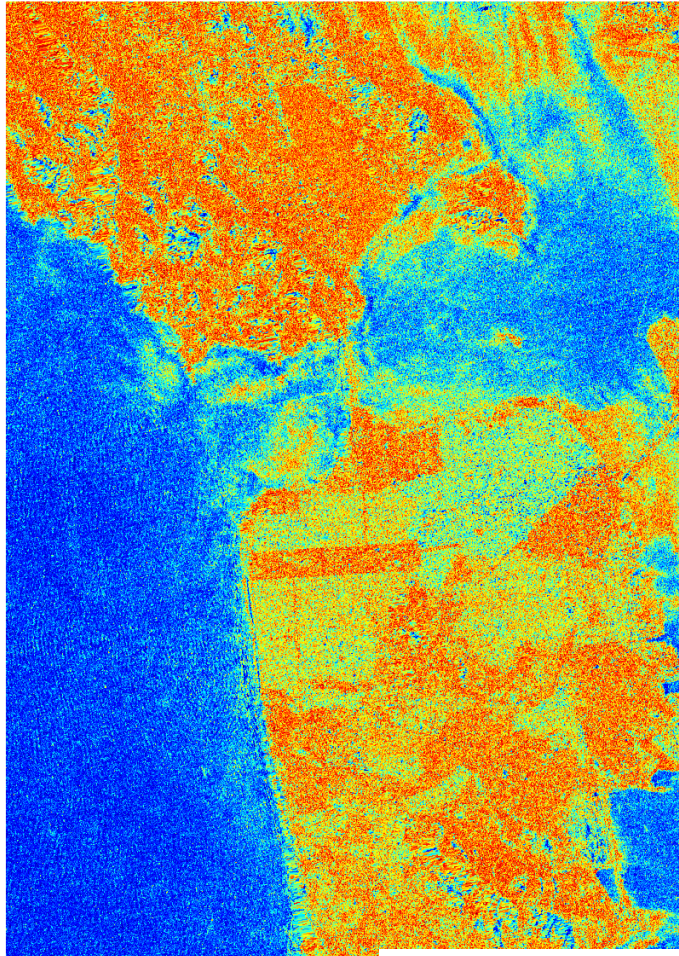
## Anisotropy



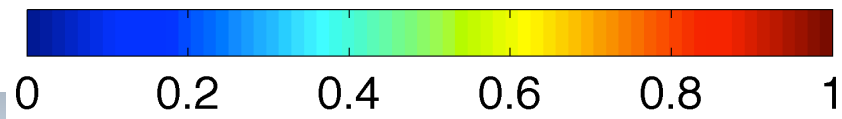
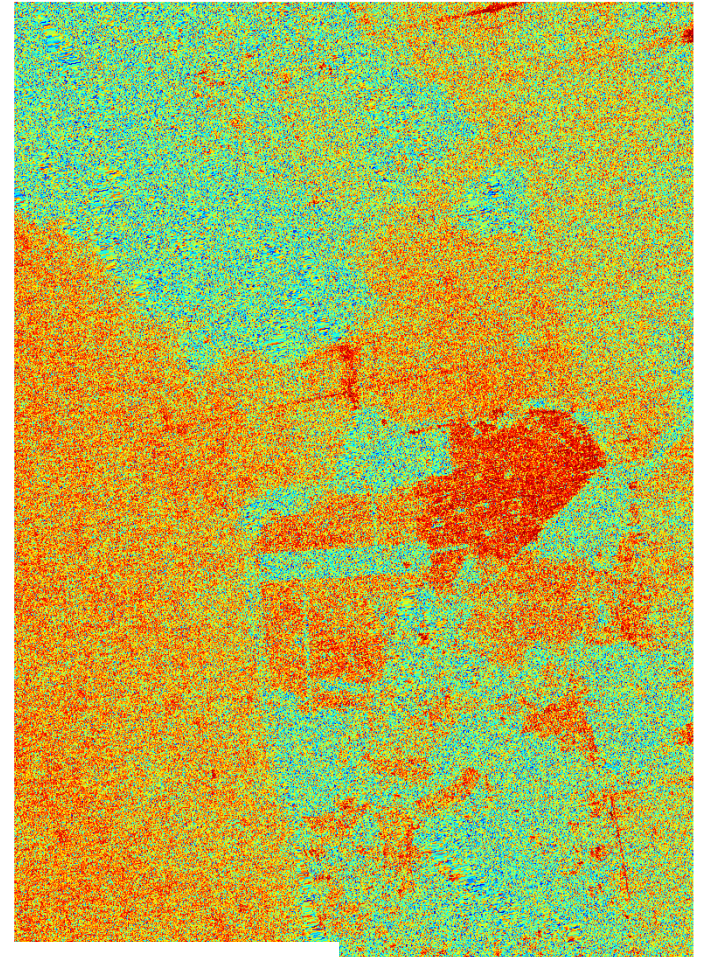


# $H$ and $A$

Entropy



Anisotropy



LUCIO MASCOLO – Radar Polarimetry

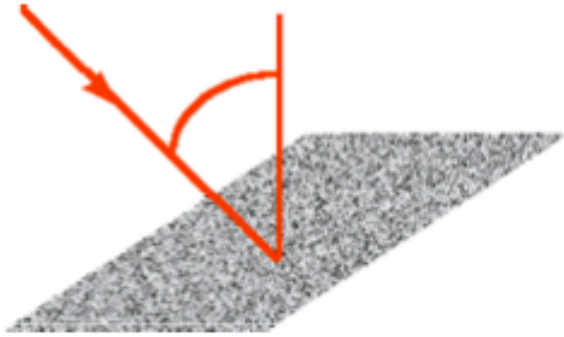




# $\bar{\alpha}$ : physical interpretation

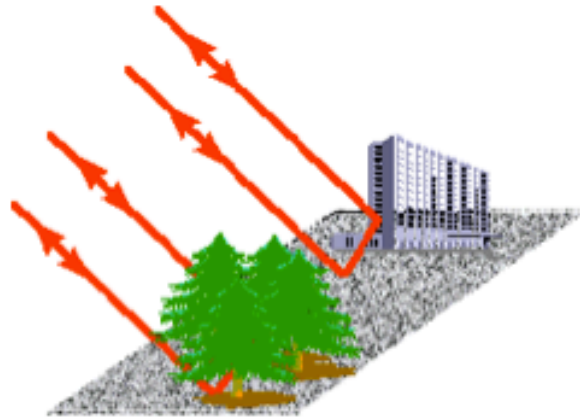
Figure adopted from [1]

**SINGLE BOUNCE  
SCATTERING  
(ROUGH SURFACE)**



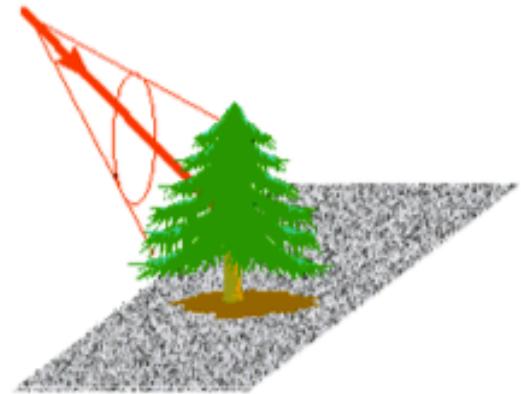
$$\bar{\alpha} \rightarrow 0^\circ$$

**DOUBLE BOUNCE  
SCATTERING**



$$\bar{\alpha} \rightarrow 90^\circ$$

**VOLUME  
SCATTERING**



$$\bar{\alpha} \rightarrow 45^\circ$$

# $H/\bar{\alpha}$ space

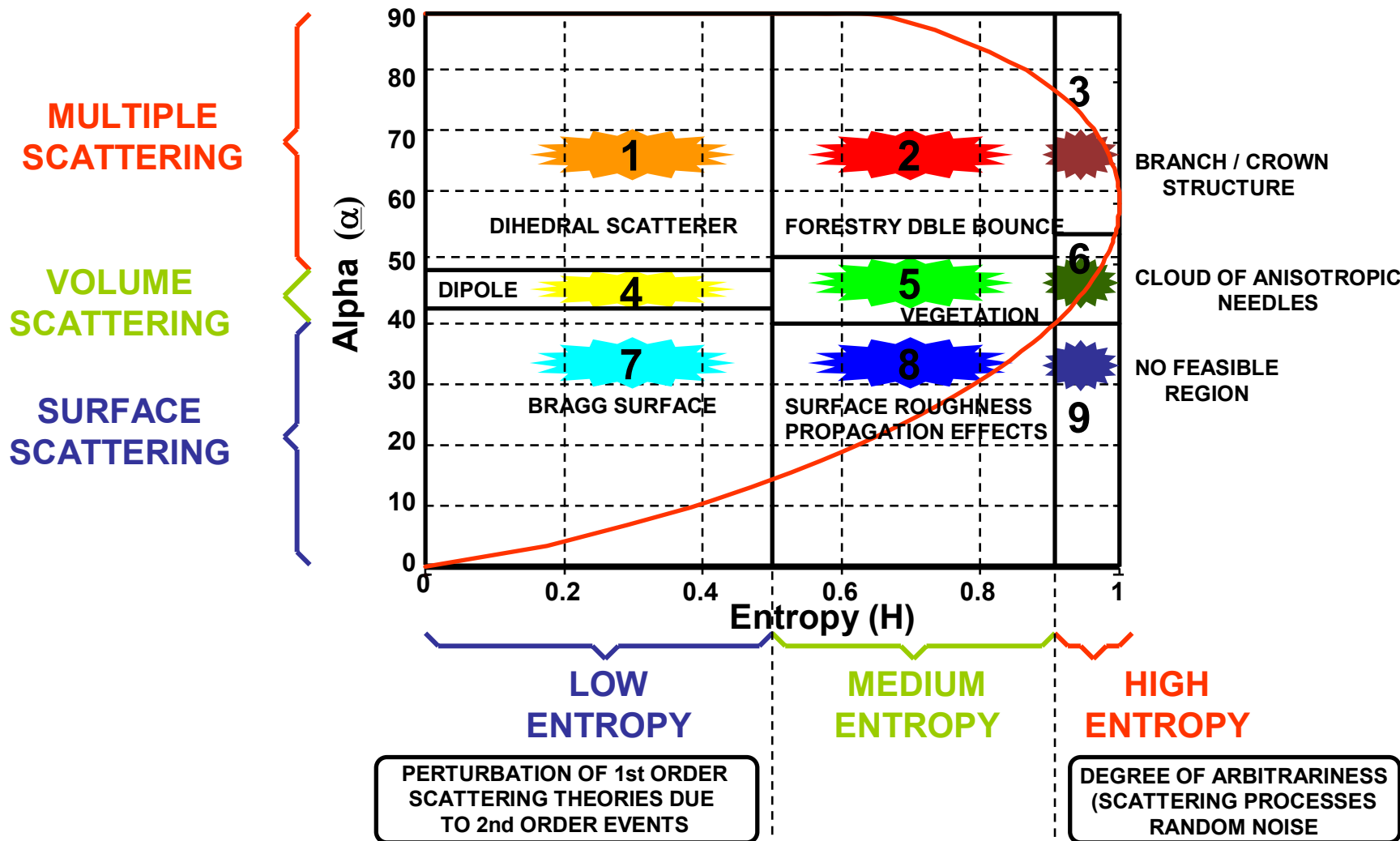


Figure adopted from [3]





$$H/\bar{\alpha}$$

$$H/A/\bar{\alpha}$$

