



Real-Aperture Radar (RAR)

Synthetic Aperture Radar (SAR)

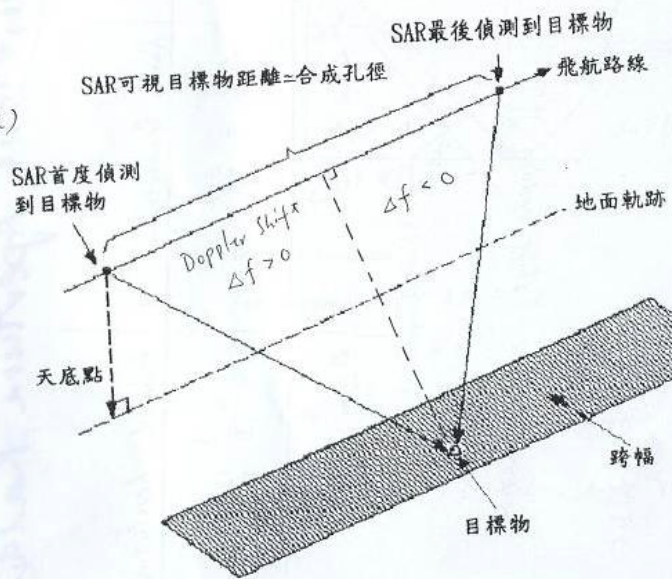


圖 2.4.6 合成孔徑雷達基本原理

Real Aperture Radar

vs

Synthetic Aperture Radar

	Slant Range Resolution	Azimuth Resolution
RLR	$\Delta R_R = \frac{c\tau}{2}$	$\Delta L = \frac{\lambda}{D} \cdot \frac{H}{\sin \theta}$
SAR	$\Delta R_R = \frac{c\tau}{2}$ $= \frac{c}{\Delta f}$ (Range Compression) ↓ Doppler Shift	$\Delta L = D$ ↑ SNR Ratio



3.3.5

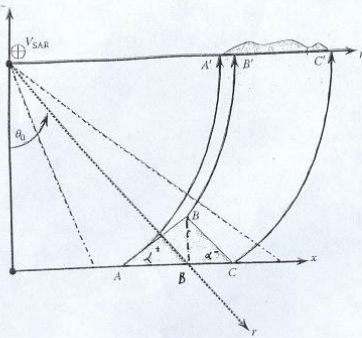


FIGURE 1.5 Foreshortening distortion.

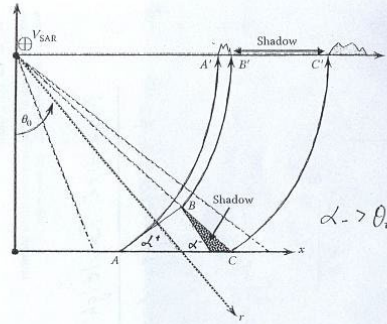
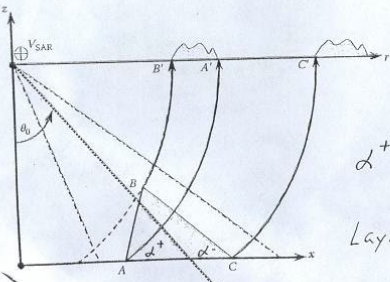


FIGURE 1.7 Radar shadow.

Foreshortening: $AB > BC$
 \downarrow
 $A'B' < B'C'$

Layover: $\alpha^+ > \theta_0$ (Look Angle)

Shadow: $\alpha^- > \theta_0$ (Look Angle)



$\alpha^+ > \theta_0$

Layover

3.4.1



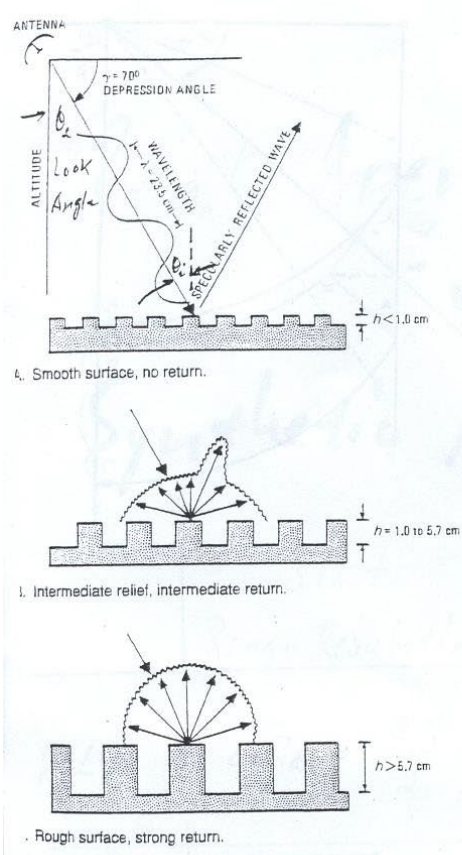


Figure 6-31 Models of surface roughness criteria and return intensity for radar images at 23.5-cm wavelength.

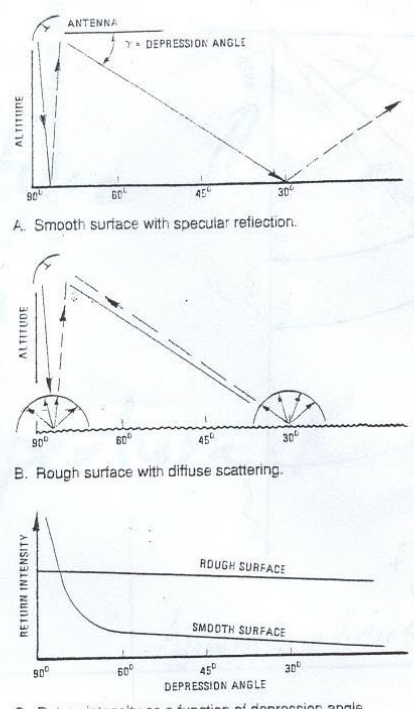


Figure 6-32 Radar return from smooth and rough surfaces as a function of depression angle.

Surface Roughness :

Modified Rayleigh Criterion

h : Surface Standard Deviation

λ : Radar Wavelength

θ_i = Local Incident Angle = $\theta_e - \alpha$ (slope angle)

$$\begin{array}{c}
 h < \frac{\lambda}{25 \cos \theta_i} < h < \frac{\lambda}{4.4 \cos \theta_i} < h \\
 \uparrow & \quad \quad \quad \uparrow & \quad \quad \quad \uparrow \\
 \text{Smooth} & \quad \quad \quad \text{Intermediate} & \quad \quad \quad \text{Rough}
 \end{array}$$