

Appendix C Nomenclature

C.1 Acronyms and Abbreviations

AIRSAR	Airborne Synthetic Aperture Radar
ALOS PALSAR	Advanced Land Observing Satellite Phased Array L-band Synthetic Aperture Radar
ASAR	Advanced Synthetic Aperture Radar (on (European Space Agency Environmental Satellite [Envisitat])
dB	power in decibels
deg	degree
DEM	digital elevation model
ed.	editor
Envisitat	European Space Agency Environmental Satellite
Eq.	Equation
ERS	European Remote Sensing Satellite
Fig.	Figure
GHz	gigahertz

HH	horizontal-horizontal
HV	horizontal-vertical
IEEE	Institute for Electrical and Electronics Engineers
IEM	Integral Equation Method
IGARSS	International Geoscience and Remote Sensing Symposium
JPL	Jet Propulsion Laboratory
NASA	National Aeronautics and Space Administration
NNED	non-negative Eigenvalue decomposition
PFR	pulse repetition frequency
RASAM	Radiometer-Scatterometer
rms	root mean square
RVI	radar thin vegetation index
SAR	synthetic aperture radar
SIR-B	Shuttle Imaging Radar-B (-C)
SIR-C/X	Synthetic Imaging Radar C-band and X-band
SLAR	side-looking aperture radars
SMAP	Soil Moisture Active Passive
SNR	signal-to-noise ratio
SPIE	Society of Photographic Instrumentation Engineers
SPM	small perturbation method
VH	vertical-horizontal

vol.	volume
VV	vertical-vertical
w.r.t	with respect to

C.2 Commonly Used Symbols

R : Range

c : Speed of light

θ or θ_i : Incidence angle

B : Radar bandwidth

τ_p : Physical pulse length

λ : Wavelength

f_0 : Center frequency

σ_N : Noise equivalent backscatter cross section

W : Antenna width

L : Antenna length

P_r : Received power by radar

P_t : Transmit power by radar

G_r : Receive antenna gain

G_t : Transmit antenna gain

σ_0 : Normalized backscattering cross section

v : Velocity of the radar platform

PRF : Pulse repetition frequency

$\hat{\mathbf{h}}$: Horizontal basis vector

$\hat{\mathbf{v}}$: Vertical basis vector

S_0, S_1, S_2, S_3 : Stokes parameters

$[\mathbf{S}]$: 2x2 complex scattering matrix

\mathbf{E}^{sc} : Scattered electric field vector

\mathbf{E}^{tr} : Transmitted electric field vector

\mathbf{p}^{tr} : Normalized transmit antenna polarization vector

\mathbf{p}^{rec} : Normalized receive antenna polarization vector

V : Voltage measured by radar system

\mathbf{A} : Antenna polarization vector

$[\mathbf{C}]$: Scatter covariance matrix

\mathbf{T} : Scatter vector

$S_{hh}, S_{vv}, S_{hv}, S_{vh}$: Elements of 2x2 complex scattering matrix

$[\mathbf{M}]$: Stokes scattering operator

$\lambda_1, \lambda_2, \lambda_3$: Eigenvalues of covariance matrix when $S_{hv} = S_{vh}$

$\hat{\mathbf{e}}_i$: Eigenvectors of covariance matrix

$\hat{\mathbf{p}}_i$: Eigenvectors of Pauli covariance matrix when $S_{hv} = S_{vh}$

H_T : Entropy

$\bar{\alpha}$: Average alpha angle for the alpha-entropy algorithm

RVI : Radar vegetation index

R_{co} : Co-polarization ratio (S_{hh} / S_{vv})

R_x : Cross-polarization ratio (S_{hv} / S_{vh})

$\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3$: Eigenvectors of covariance matrix when $S_{hv} = S_{vh}$

$[\mathbf{T}_R]$: Tilt transformation matrix from the local to the global coordinates

$[\mathbf{R}]$: Receive system distortion matrix for calibration

$[\mathbf{T}]$: Transmit system distortion matrix for calibration

$[\mathbf{D}]$: System distortion matrix for calibration

m_v : Volumetric soil moisture

ε : Dielectric constant

σ_{hh} : HH normalized backscattering cross section

σ_{hv} : HV normalized backscattering cross section

σ_{vh} : VH normalized backscattering cross section

σ_{vv} : VV normalized backscattering cross section