Tabe S1 – The table describes the details associated with constructing of the main GLCM features used in our study.

We use a band with VV polarization to construct texture features based on the GLCM, Spatial correlation, and Convolution methods. VH polarization band was used separately.

Below are details on how features were calculated.

Texture features refer to the spatial variation of image greyscale levels (tone) as a scale function. When combined with SAR data, the texture provides another level of information for interpreting features in pixel-based classification. Based on the spatial resolution of Sentinel Images 1, we use the 4x4 as kernel size. GLCM of an image is computed using a displacement vector d, defined by its radius δ and orientation θ. GLCM dimension is determined by the maximum gray value of the pixel. The number of gray levels is an essential factor in GLCM computation. GLCM method is susceptible to the number of gray levels. The textural features are based on statistics that summarize the relative frequency distribution, which describes how often one gray tone will appear in a specified spatial relationship to another gray tone on the image.

Haralick et al., 1973 / Conners et al., 1984 use following notations to explain how to calculate GLCM textural features:

= entry in GLCM;

= entry in marginal probability matrix obtained by summing rows of

Number of distinct gray levels in the image

= where i+j = k = 2, 3, …, 2

= where |i+j| = k = 0, 1, …,

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature names** | **Method** | **Calculation formula** | **Description** |
| Sum Average - savg | GLCM |  | Measures the mean of the gray level sum distribution of the image |
| Sum Entropy - sent | GLCM |  | Measures the disorder related to the gray level sum distribution of the image |
| Inverse Difference Moment - idm | GLCM |  | Measures the smoothness (homogeneity) of the gray level distribution of the image; it is (approximately) inversely correlated with contrast—if contrast is small, usually homogeneity is large |
| Information Measure of Corr. 1 - imcorr1 | GLCM |  | Measures the correlation between the probability distributions of ii and jj (quantifying the complexity of the texture), using mutual information I(x, y) |
| Information Measure of Corr. 2 - imcorr2 | GLCM |  | Measures the correlation between the probability distributions of ii and jj (quantifying the complexity of the texture). |
| Angular Second Moment – asm | GLCM |  | Measures the uniformity (or orderliness) of the gray level distribution of the image; images with a smaller number of gray levels have larger uniformity |
| Contrast - contrast | GLCM |  | This statistic measures the spatial frequency of an image and is difference moment of GLCM. It measures the amount of local variations present in the image. A low contrast image presents GLCM concentration term around the principal diagonal and features low spatial frequencies |
| Correlation – corr | GLCM |  | Measures the linear dependency of gray levels on those of neighboring pixels; it provides a measure similar to autocorrelation methods |
| Difference entropy - dent | GLCM |  | Measures the disorder related to the gray level difference distribution of the image |
| Difference variance - dvar | GLCM |  | Measures the dispersion (with regard to the mean) of the gray level difference distribution of the image |
| Sum Variance - svar | GLCM |  | Measures the dispersion (with regard to the mean) of the gray level sum distribution of the image |
| Inertia – inertia | GLCM |  | Measures the mosaicity of images clusters of which consist of pixels with significantly different brightness. Textures comprising clusters with approximately equal pixel brightness have a nearly zero inertia coefficient. For uncorrelated white noise, the inertia is maximal, and for a uniform background, it is zero |
| Cluster prominence – prom | GLCM |  | Measures asymmetry. When the cluster prominence value is high, the image is less symmetric. In addition, when cluster prominence value is low, there is a peak in the GLCM matrix around the mean values |
| Cluster Shade - shade | GLCM |  | Cluster Shade is a measure of the skewness and uniformity of the GLCM. A higher cluster shade implies greater asymmetry about the mean |
| Dissimilarity - diss | GLCM |  | Measures the relationship between occurrences of pairs with similar intensity values and occurrences of pairs with differing intensity values. |
| Entropy - ent | GLCM | - åå *gij* log2 *gij*  *i J* | Measures the disorder or complexity of an image. The entropy is large when the image is not texturally uniform and many GLCM elements have very small values. Complex textures tend to have high entropy |
| Variance - var | GLCM |  | Measures the dispersion (with regard to the mean) of the gray level distribution |
| Geary’s C - gearys | Spatial correlation |  | Measure of spatial autocorrelation or an attempt to determine if adjacent observations of the same phenomenon are correlated. |
| Opened - opened | Mathematical morphology |  | Removing internal noise present inside an image.  This operator removes foreground pixels from the edges of the image. |
| Smooth - smooth | Convolution | **y(n)=x(n)\*h(n)** | Perform linear convolutions on images. Smoothing to remove high-frequency information |

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