Algorithm Development of Global Land Cover Classification

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■ OBJECTIVE

to develop global land cover classification algorithm for multi-temporal SGLI reflectance products.

■ STUDY DATA

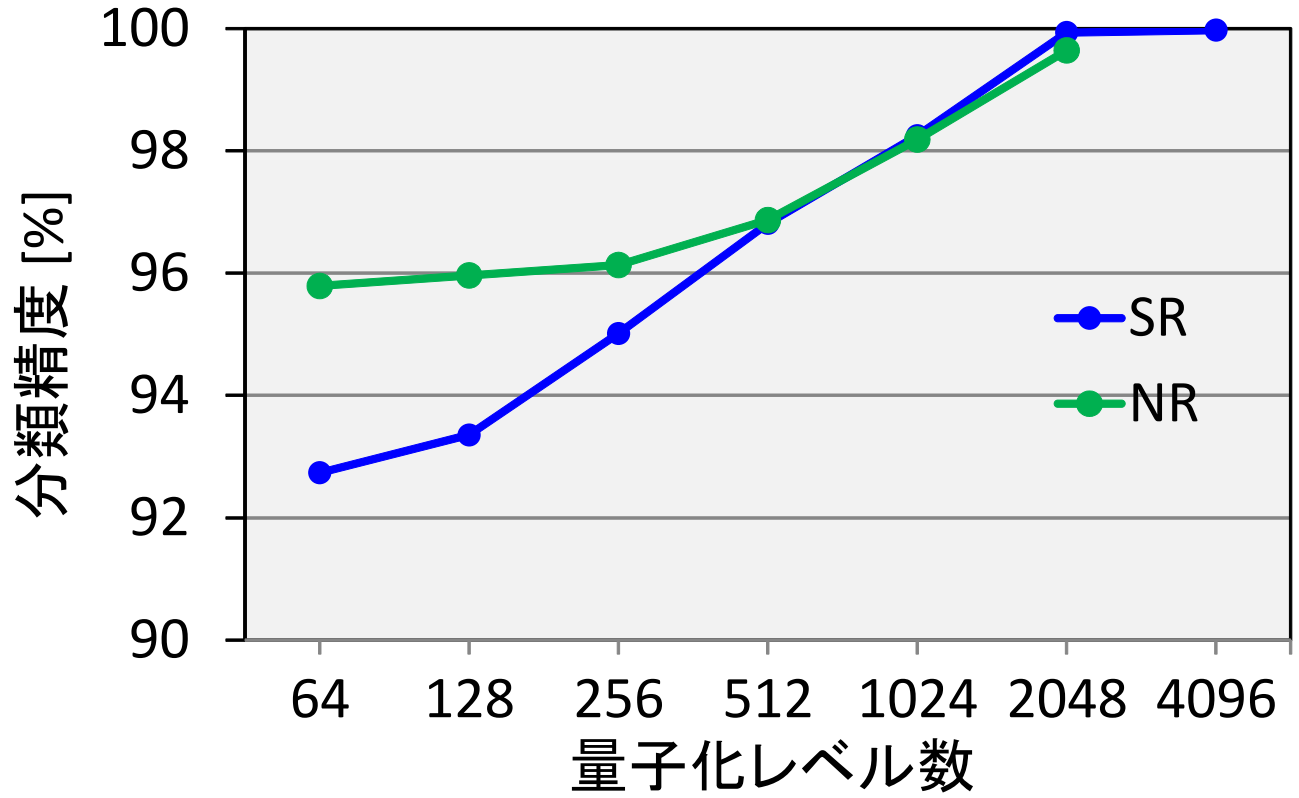
MODIS Reflectance Products

■ PROBLEMS Clarified in The Last Fiscal Year

1. Overlearning
2. Stability of Classification Results
3. Verification Method for Classification Results

1. Overlearning

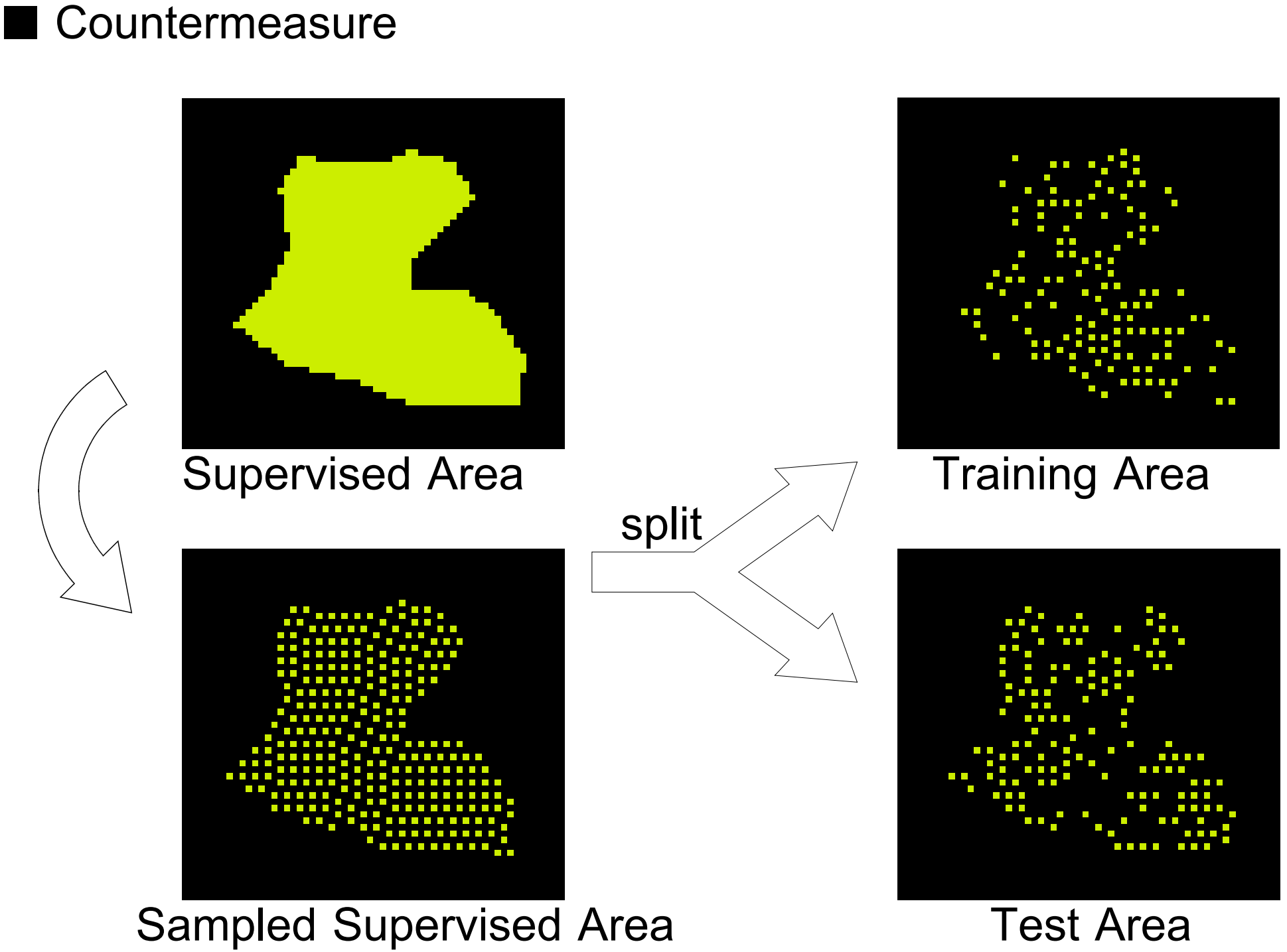
■ Example



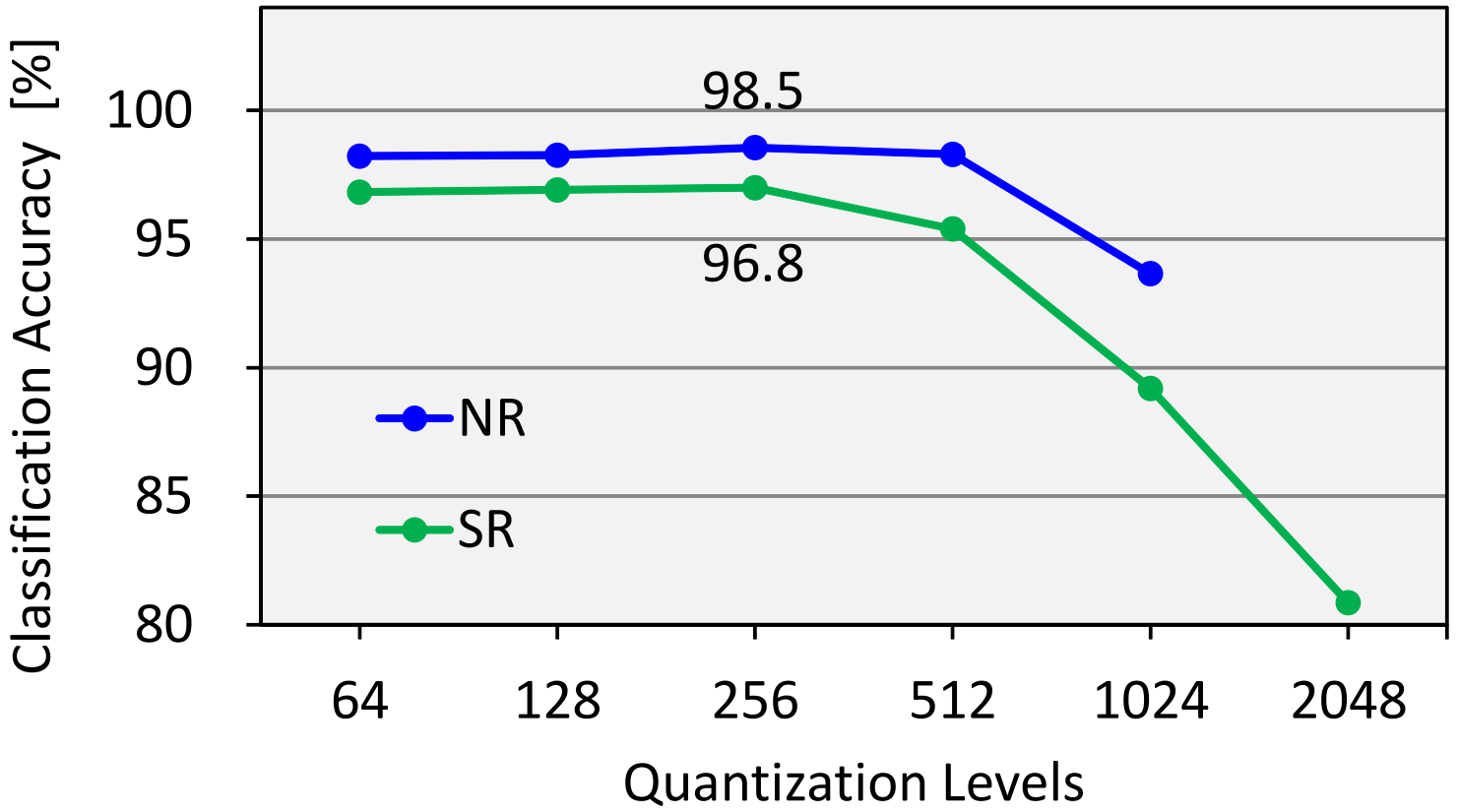
Estimated classification accuracy has no meaning.

■ Cause

Test Samples = Training Samples


Countermeasure
Supervised Area
Training Area
split
Sampled Supervised Area
Test Area

■ Result



Overlearning does not appear.

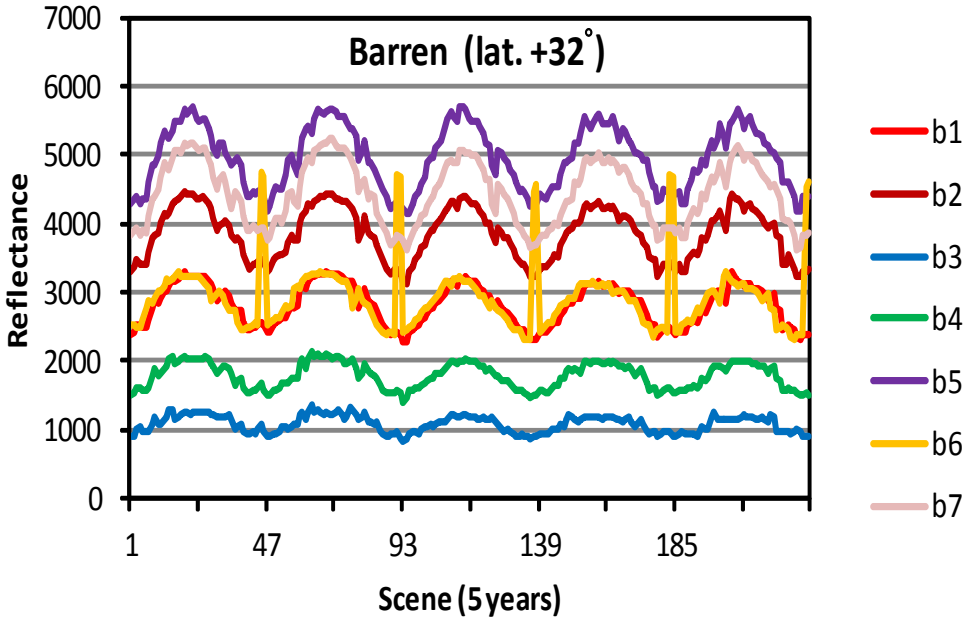
➡ Estimated classification accuracy has meaning.

2. Stability of Classification Results

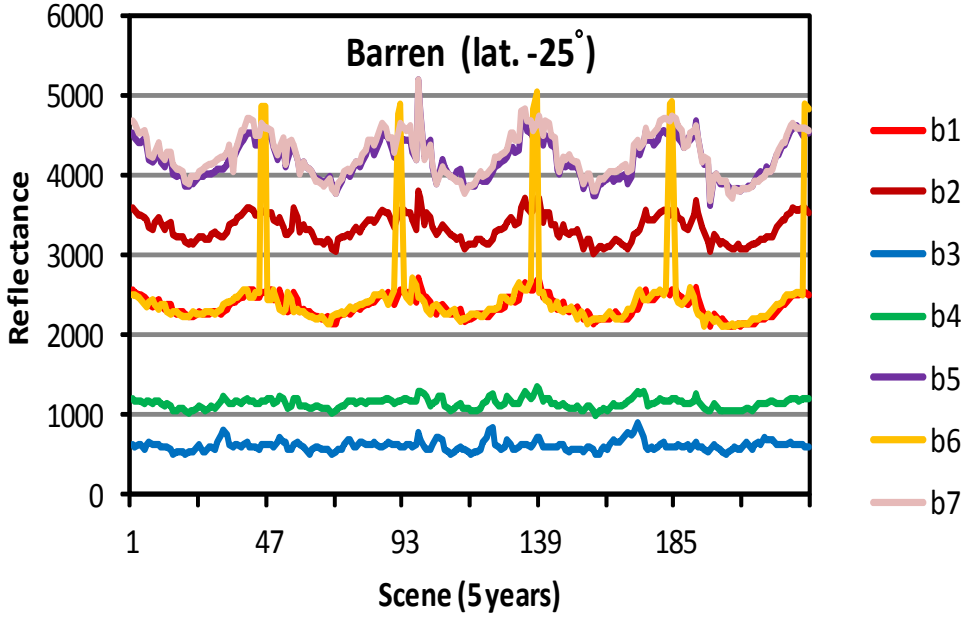
2.1 Spatial Stability of Reflectance in MODIS products

■ Example

[clear case]

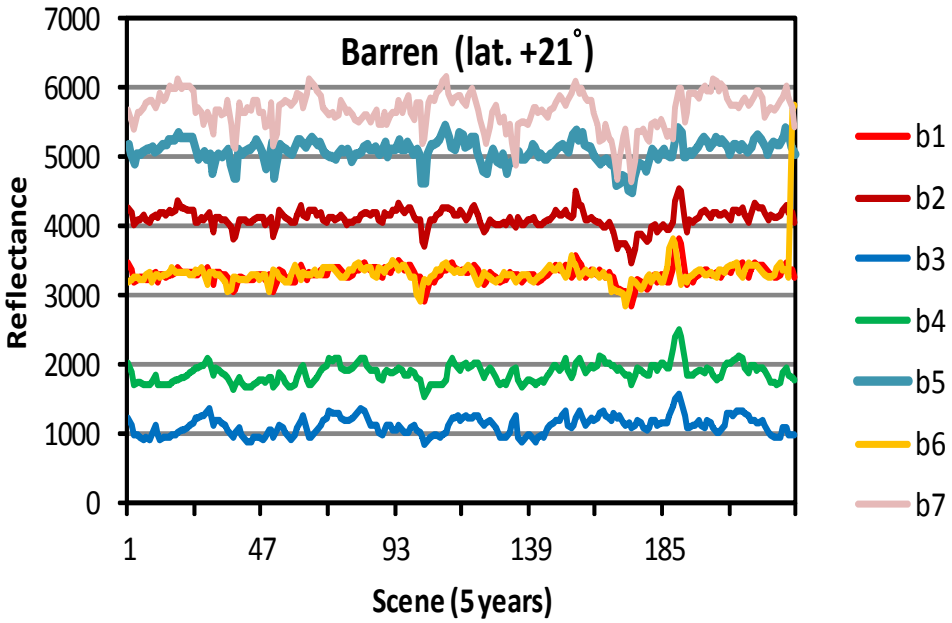


northern hemisphere

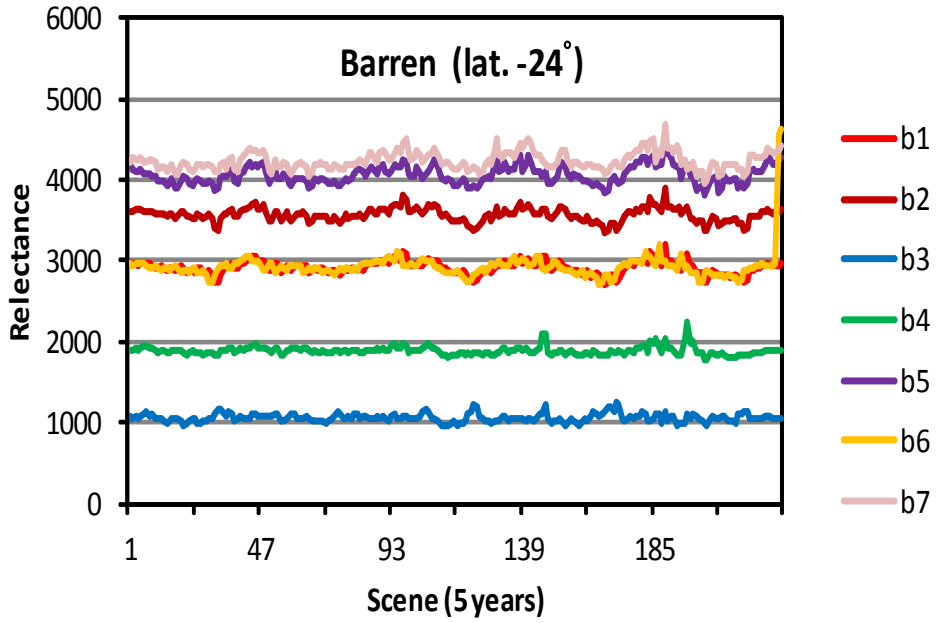


southern hemisphere

[unclear case]



northern hemisphere



southern hemisphere

■ Cause

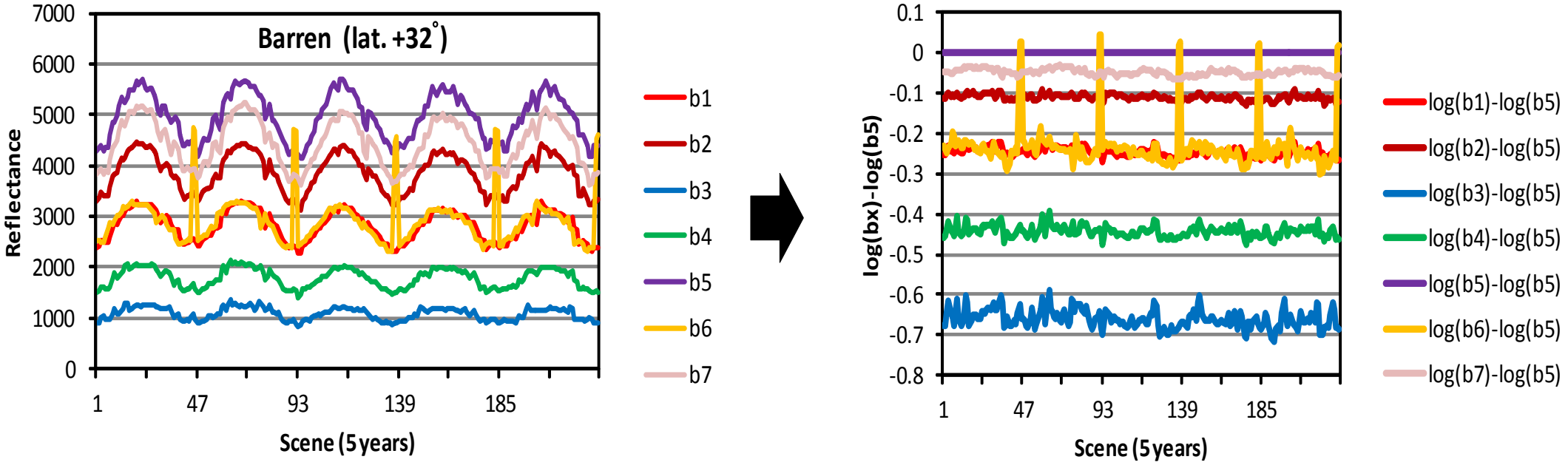
Solar Irradiance, BRDF, Topography, ...

■ Countermeasure

Solar Irradiance Correction:

log(reflectance)-log(reflectance of band5)

■ Result

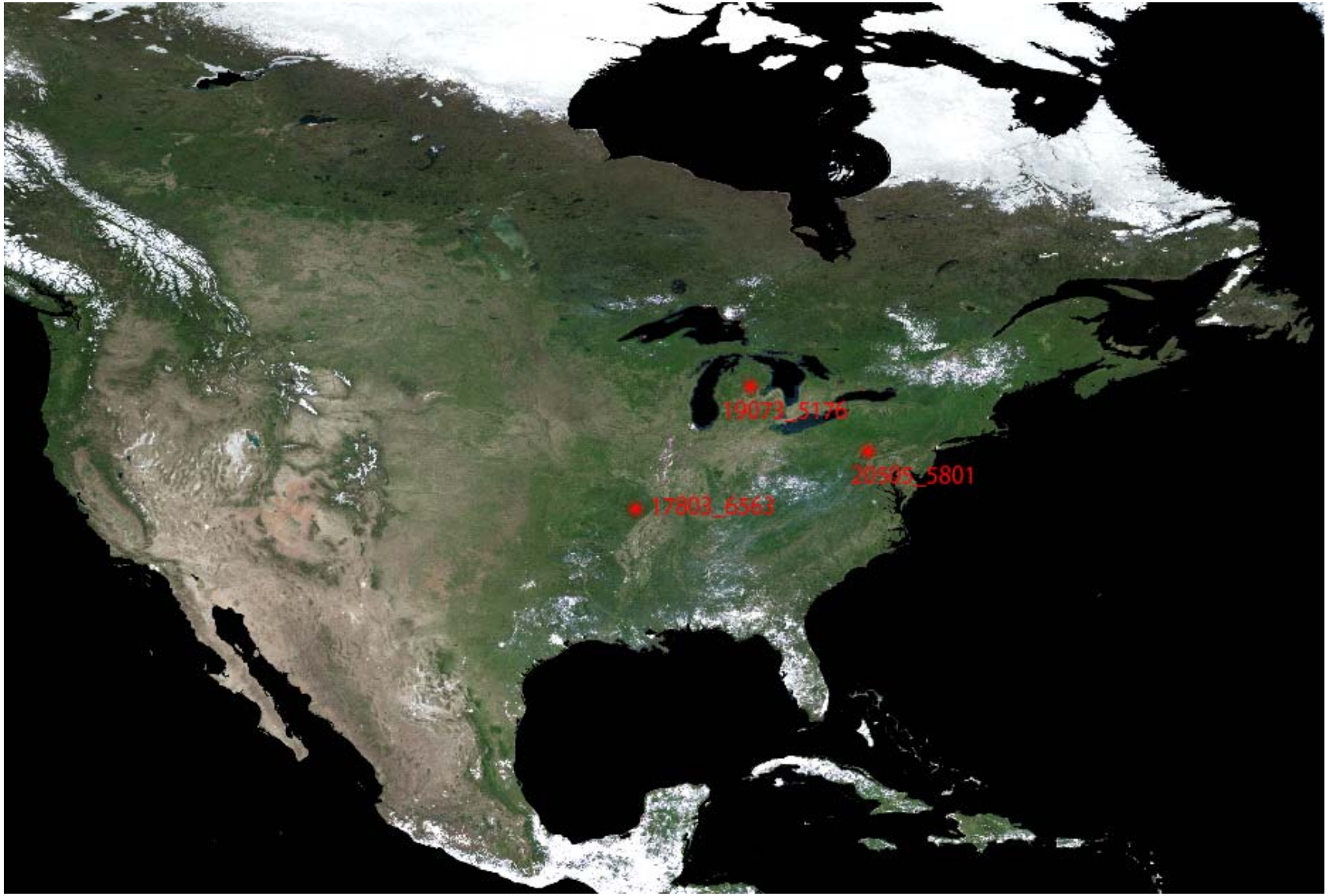


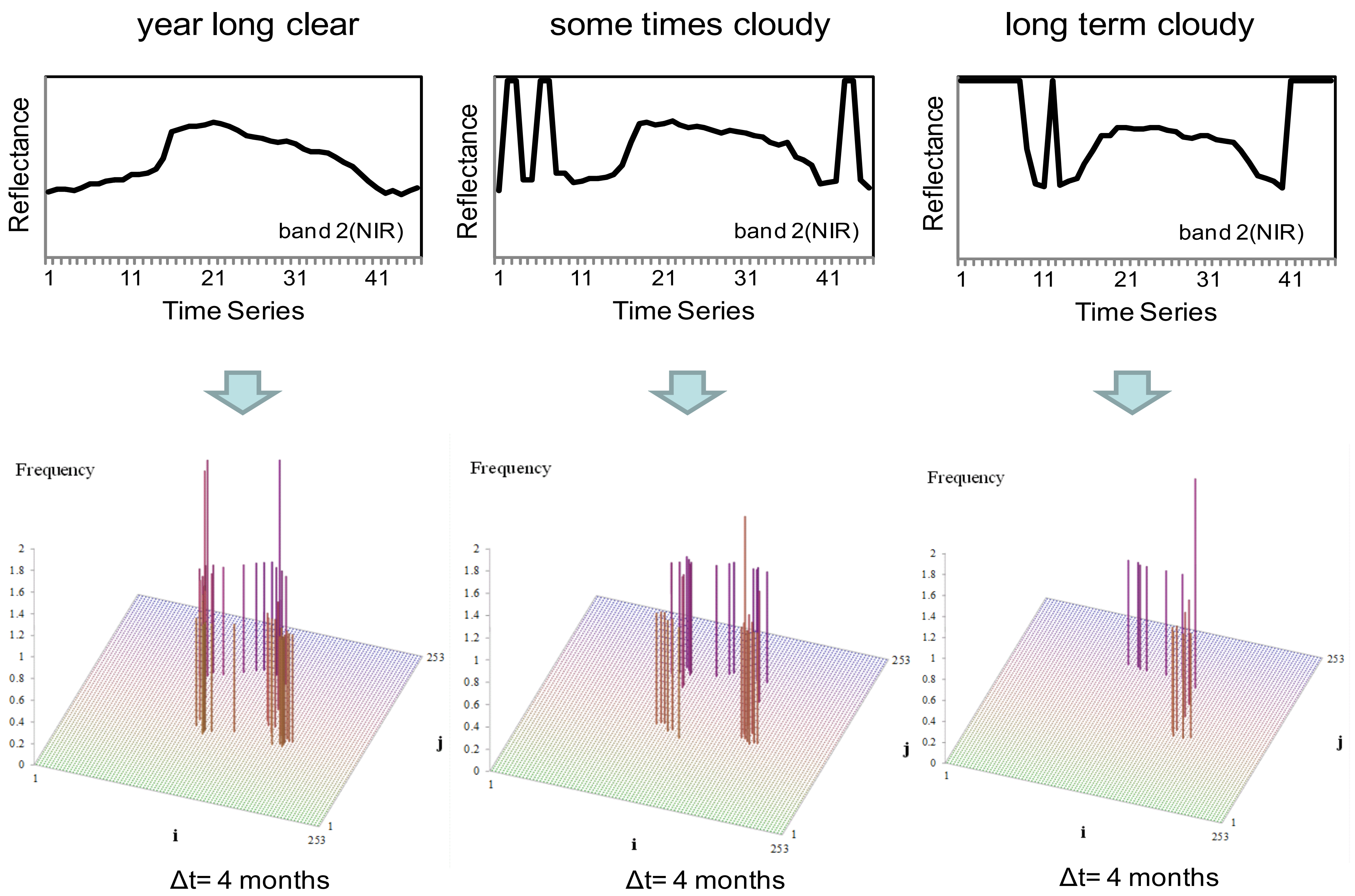
example of northern hemisphere

➡ Dimentions of feature space decreases from 7 to 6.

2.2 Stability of Time-domain Co-occurrence Matrix

■ Example : cloud/snoe noize



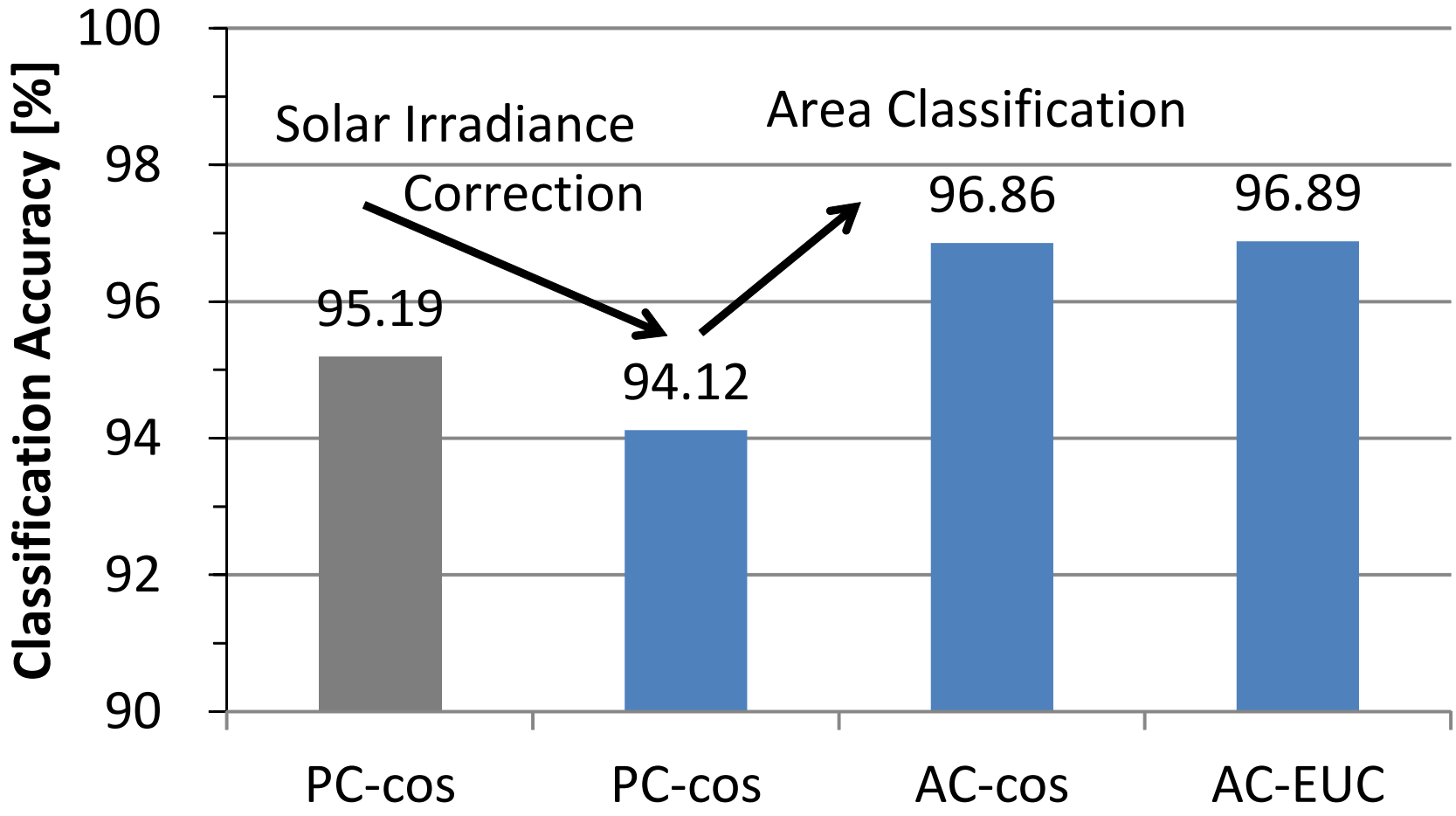


➡ time-domain co-occurrence matrix : sparse

■ Countermeasure

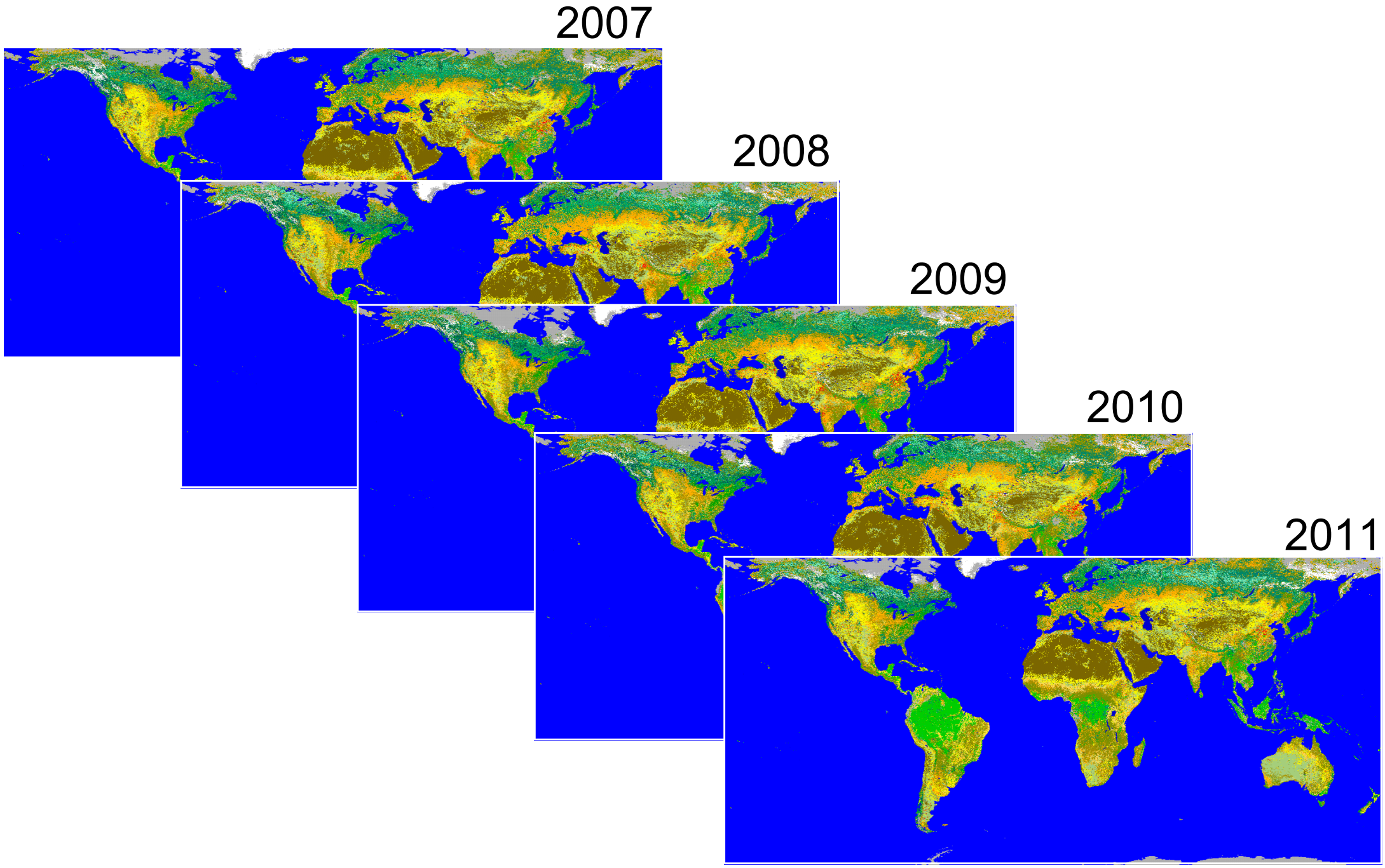
Area Classification : using 8 neighbour pixels with weight

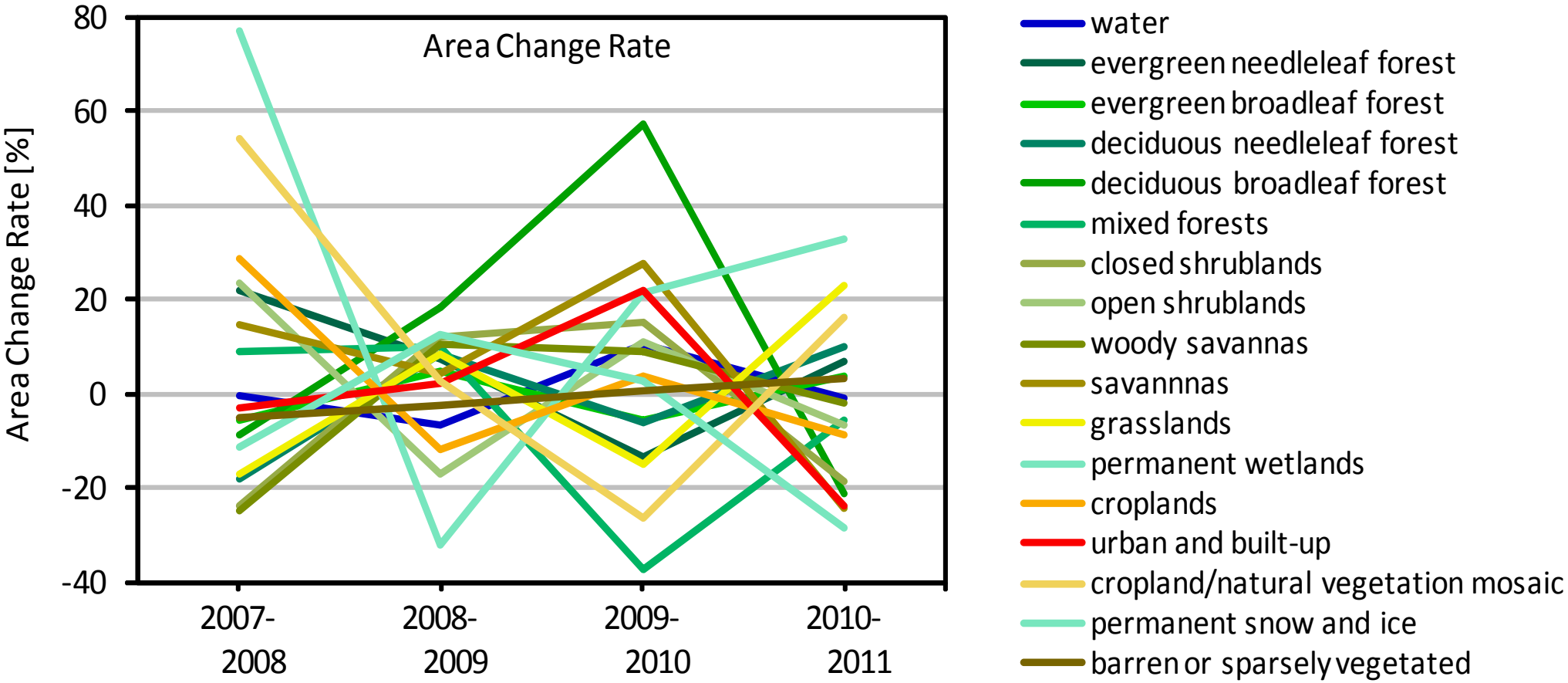
■ Result for Classification Accuracy



2.3 Stability for Multiple Year

■ Example



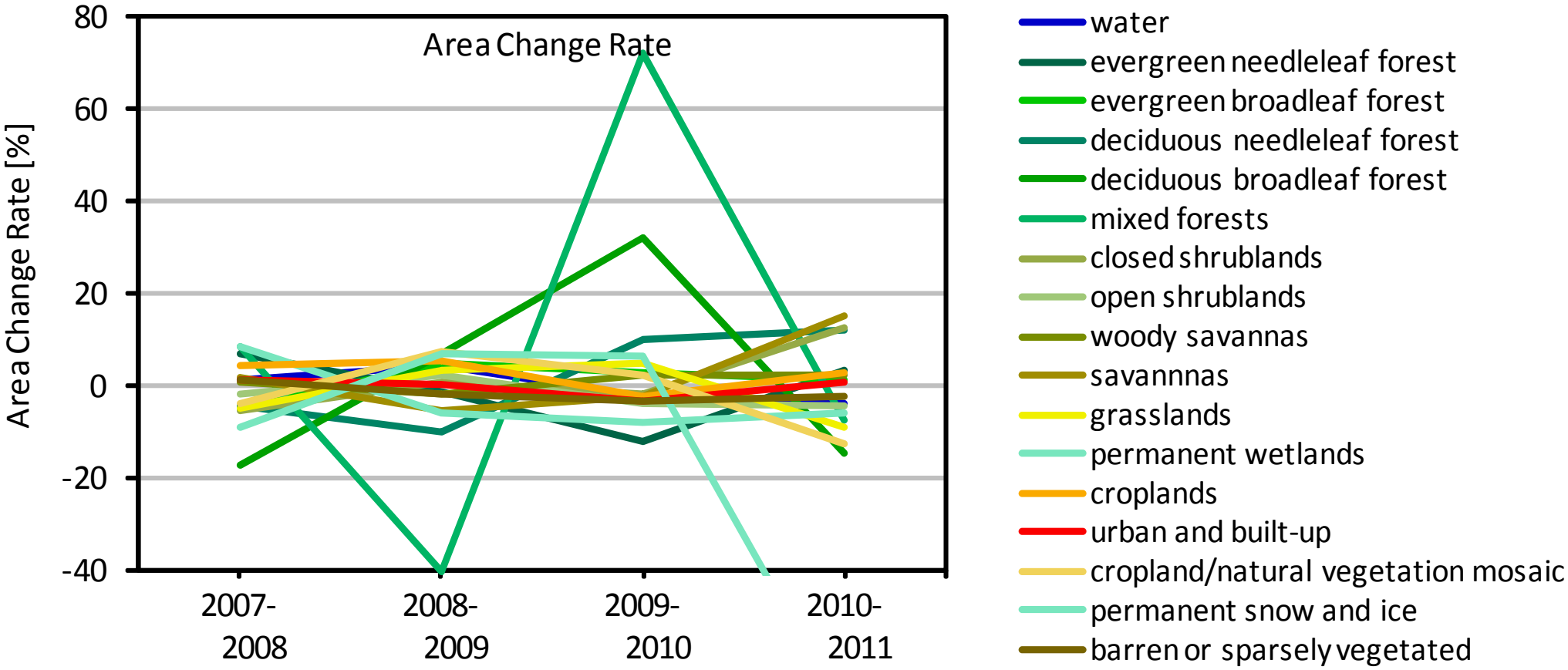


Area Change Rate (the last FY)

■ Countermeasure

unify/integrate some classification results (cos, EUC)

■ Result

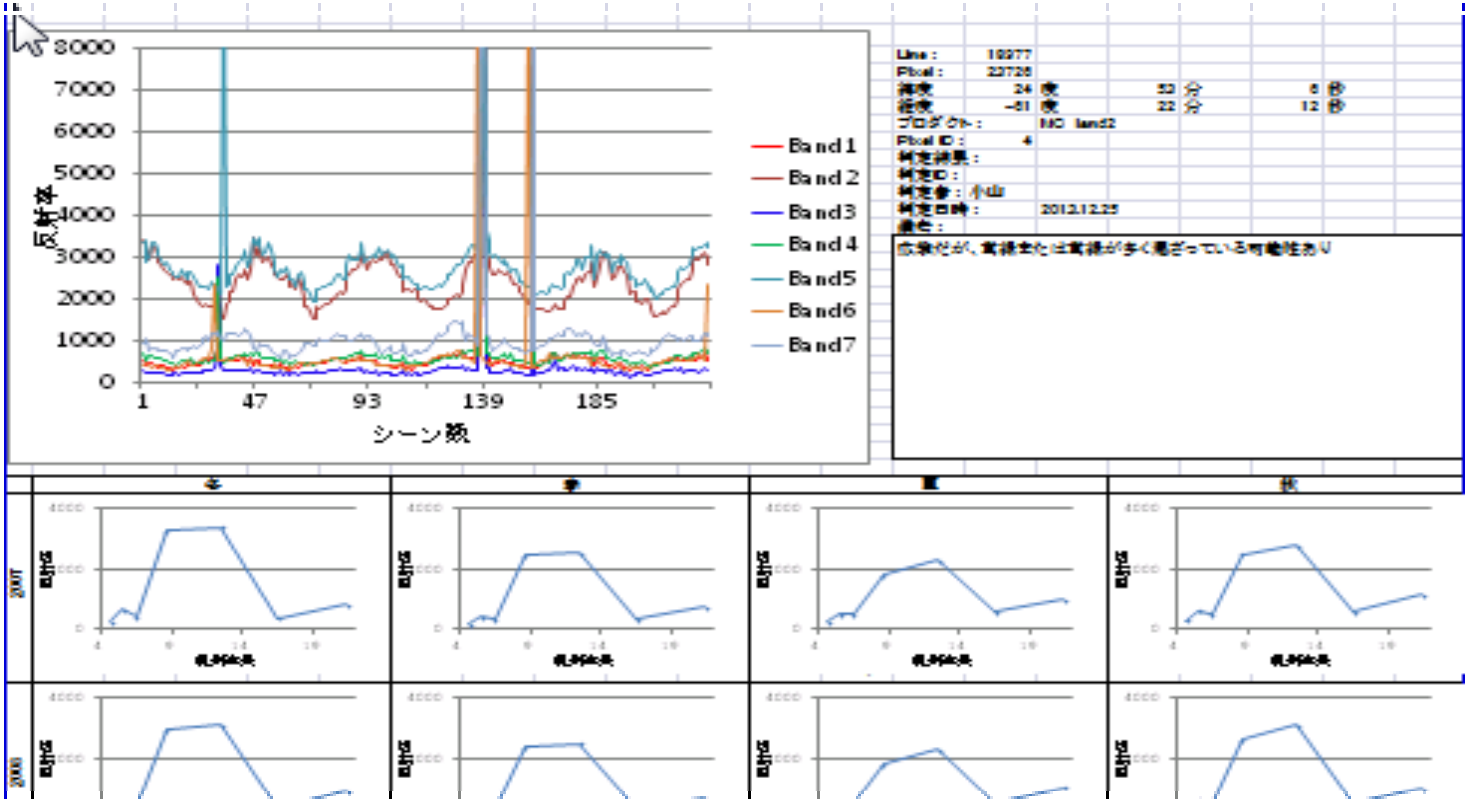


3. Verification Method for Classification Results

■ Strategy

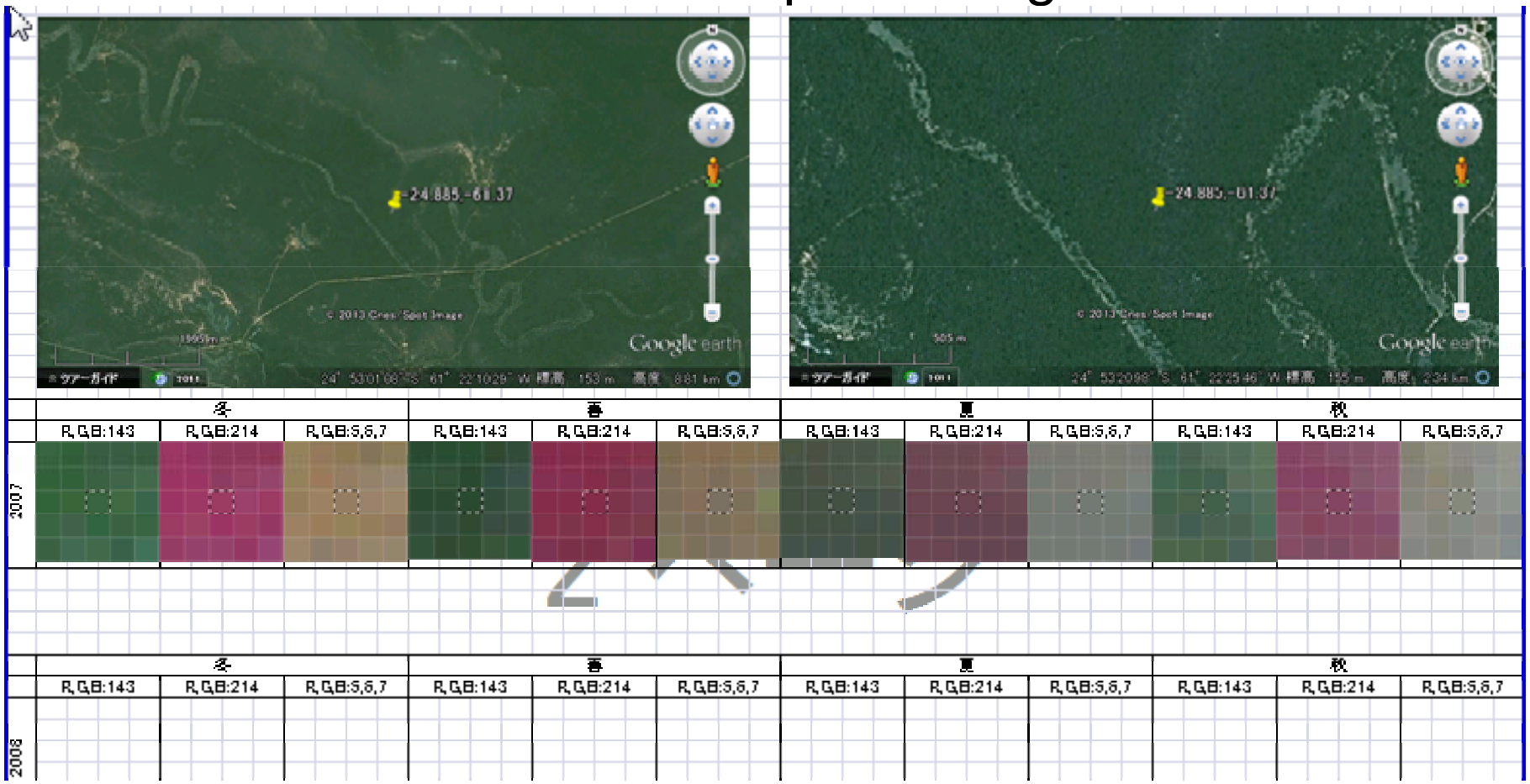
(1)random sampling of verification points for each category in the classification result
(2)human interpretation for thoes verification points

■ method



Sheet of Spectral Characteristic

Sheet of the point Image



■ Trial Result and Workload Assessment

10 points/category :　2 ～ 4 man-week

100 points/category :　5 ～ 10 man-month
(It seems not to be impossible work.)

Concept of the Proposed Classfication Method

(1) Classification Feature

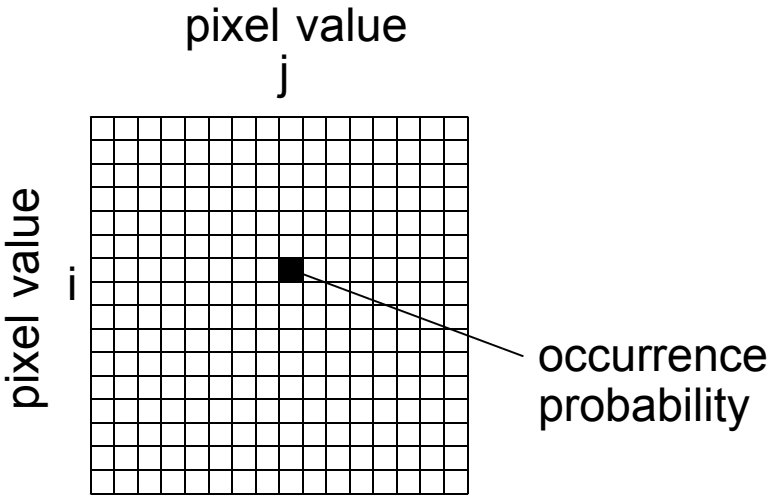
➡ time domain co-occurrence matrix

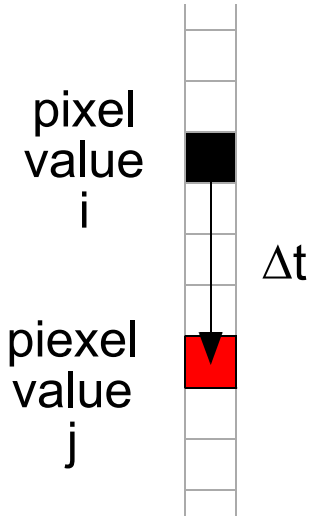
(2) Classifier

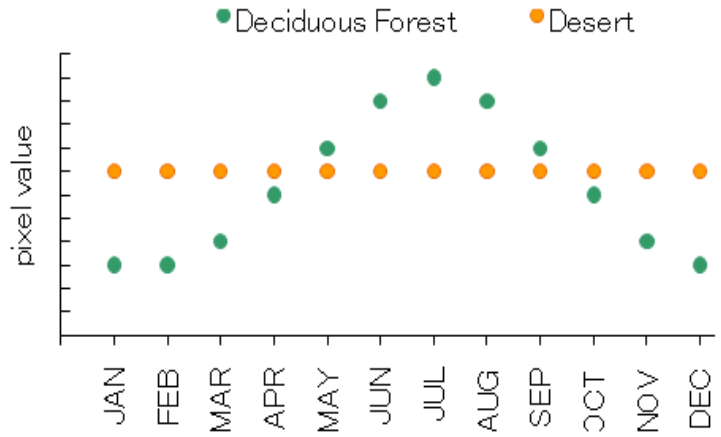
➡ non-parametric minimum distance classifier

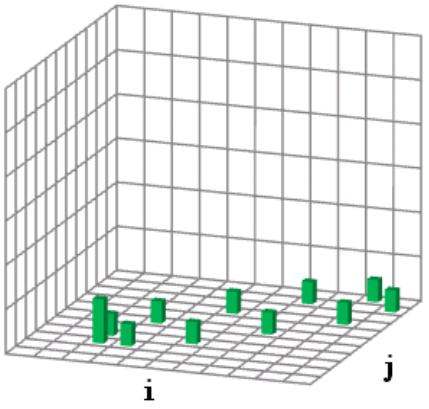
■ Proposed Time Domain Co-occurrence Matrix

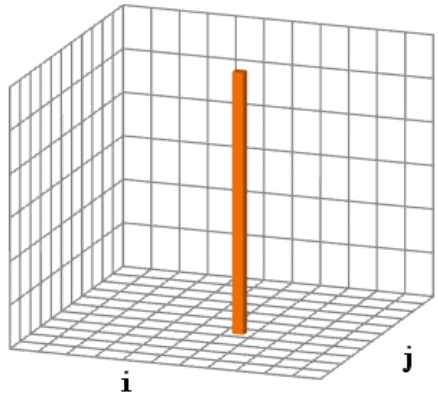
Each elements (i, j) of the time-domain co-occurrence matrix is defined as probability that two pixels with a specified time-separation delta-t in the same spatial position have pixel value i and j.





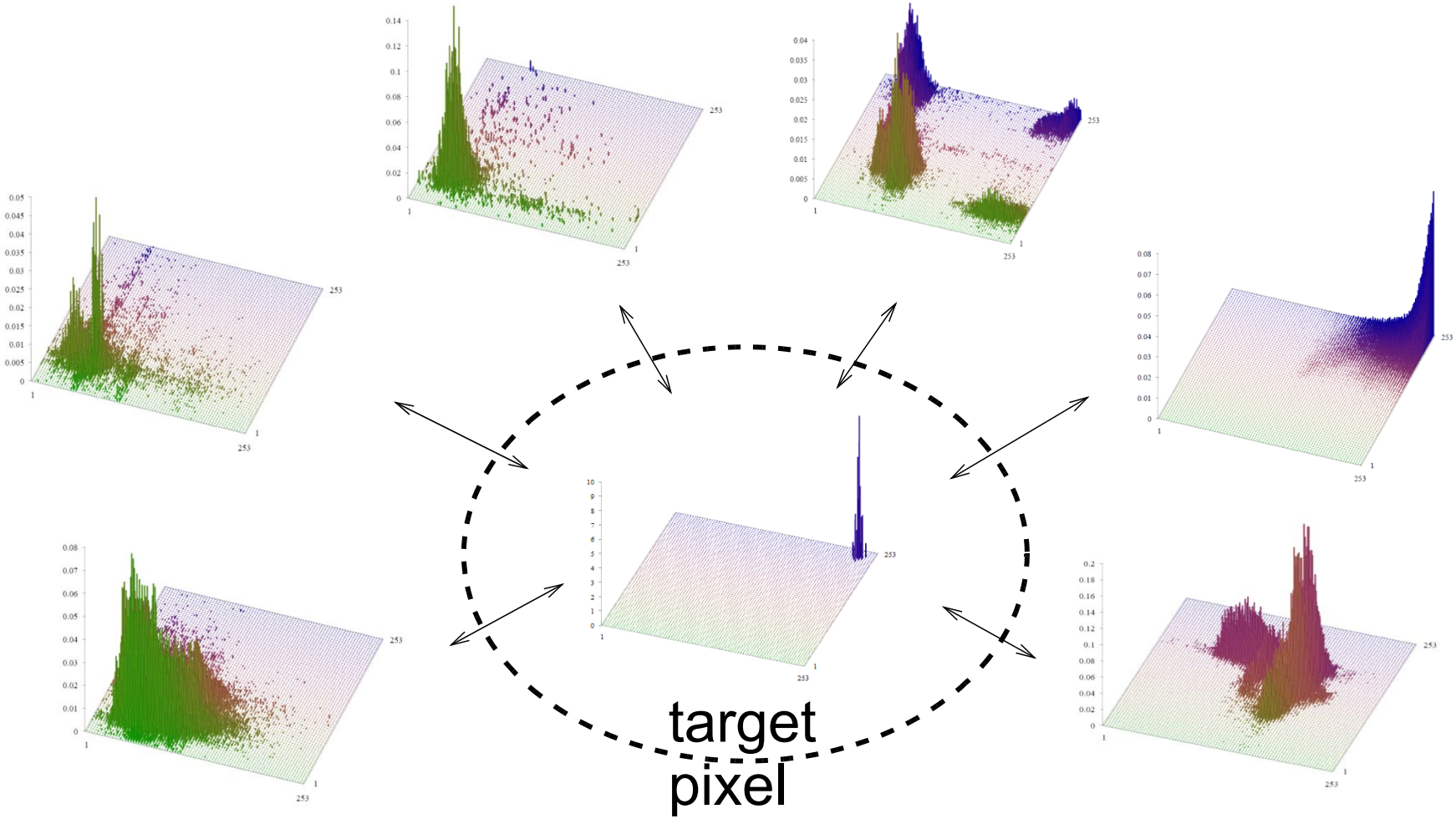






■ Proposed Non-Parametric Minimum Distance Classifier

pattern matching for time-domain co-occurrence matrix



■ Training Area