Potential of RADARSAT-2 Data for Paddy Rice Detection in a Watershed in Northern Vietnam

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Context

The optical method based on optical images for classifying and for the cartography of land cover (Hoang et al., 2008) is well established in the context of Câu river basin watershed (North Vietnam) management and can be considered efficient.
However:

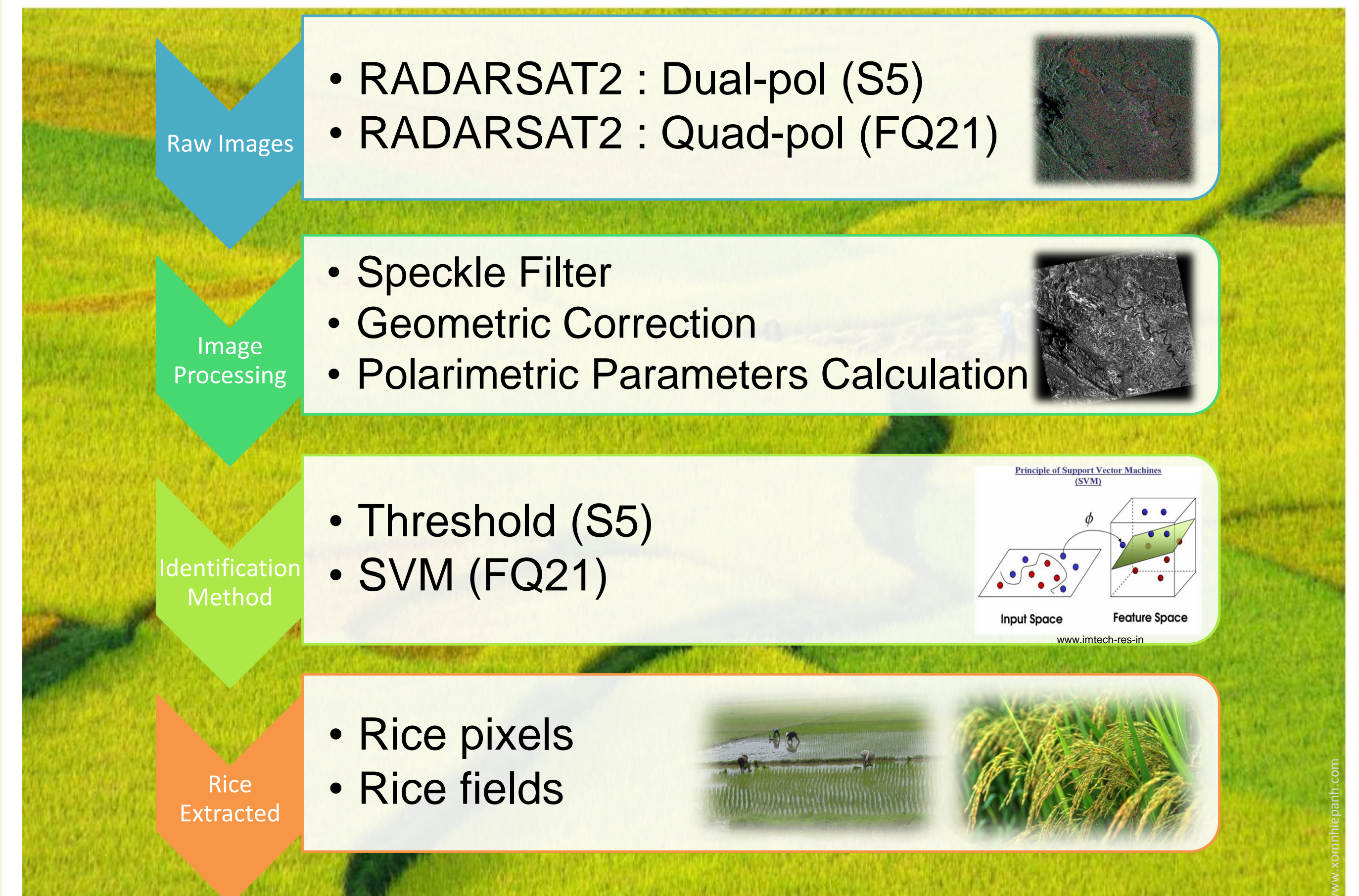1. Land use is complex

2. Cloud cover is frequent

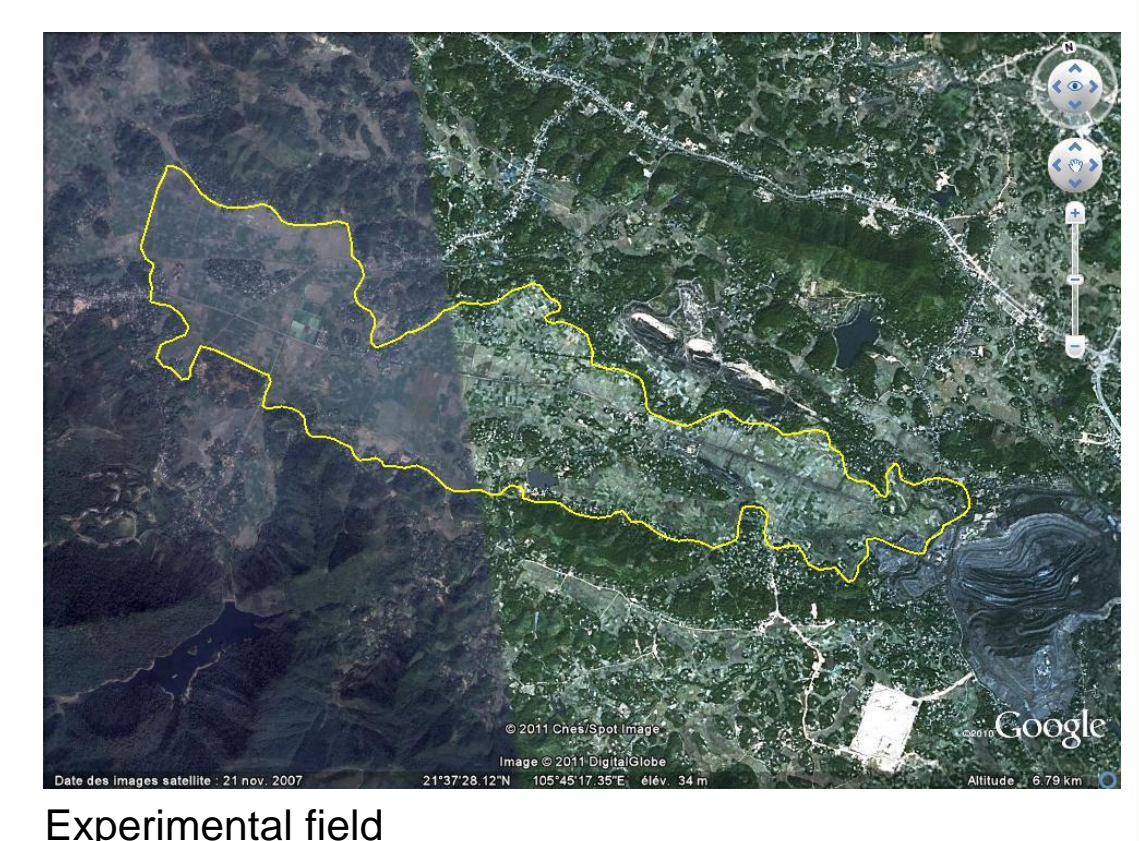Mix of home garden, plantations, residents and mix of diverse vegetations (maize, vegetable, rice, etc.)
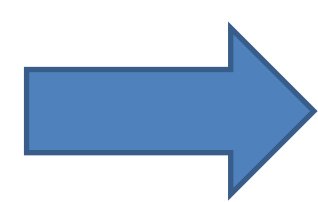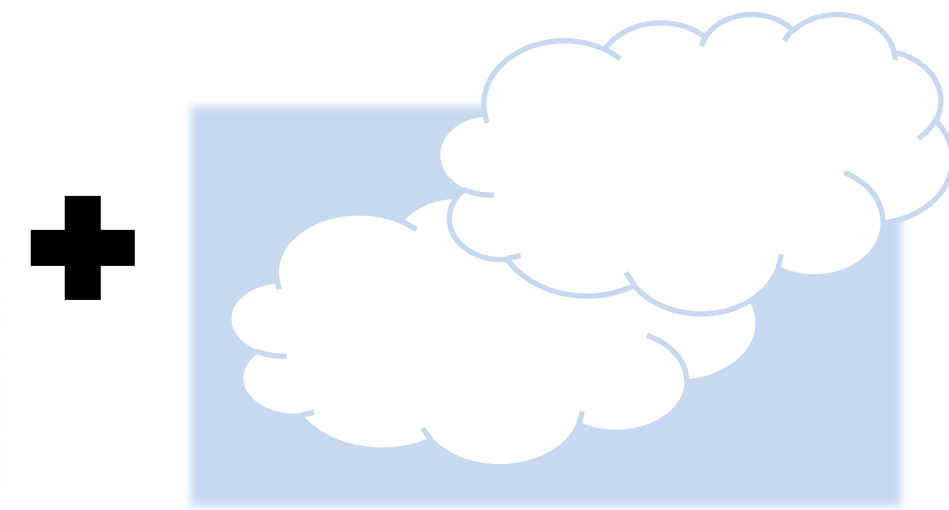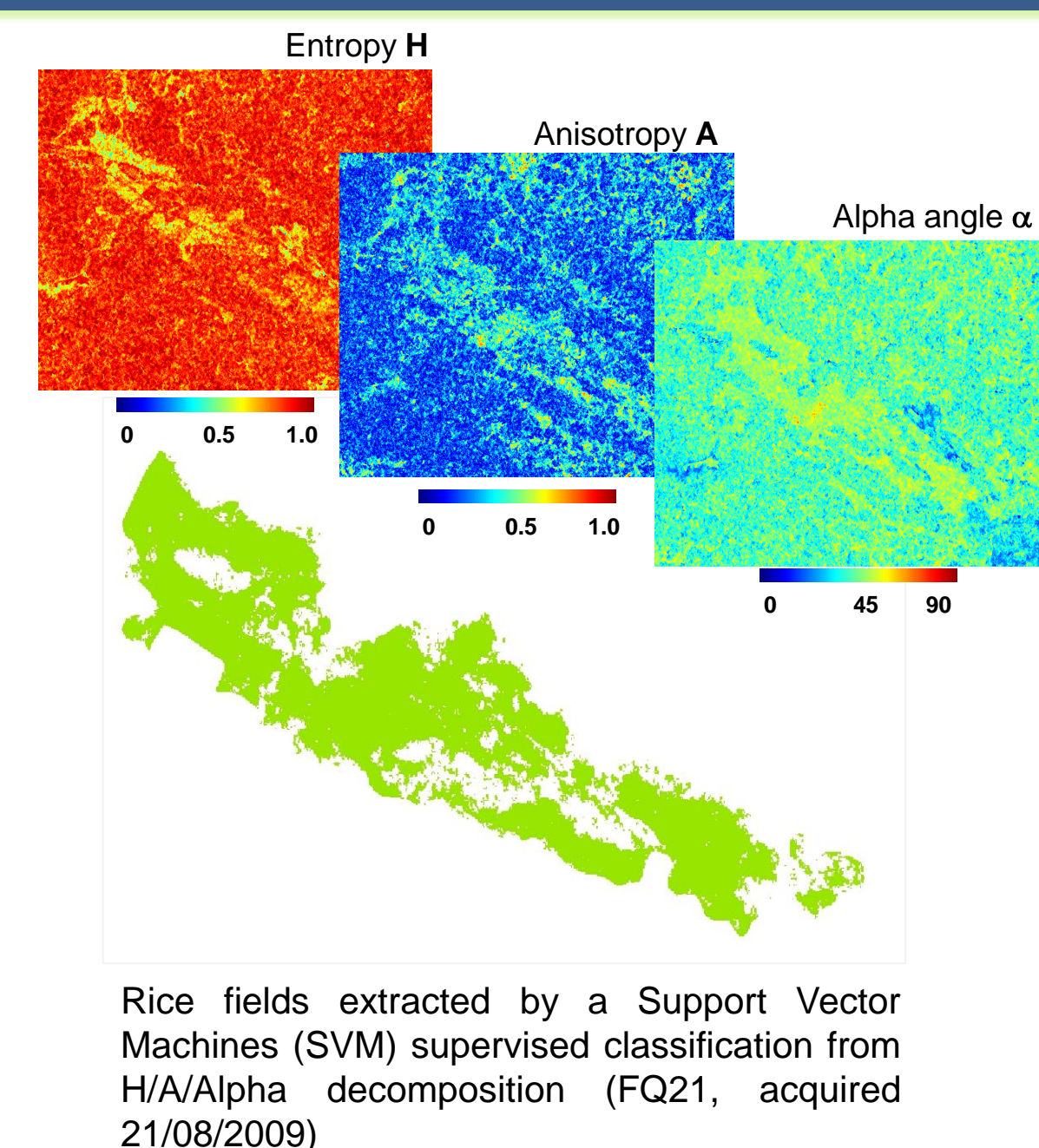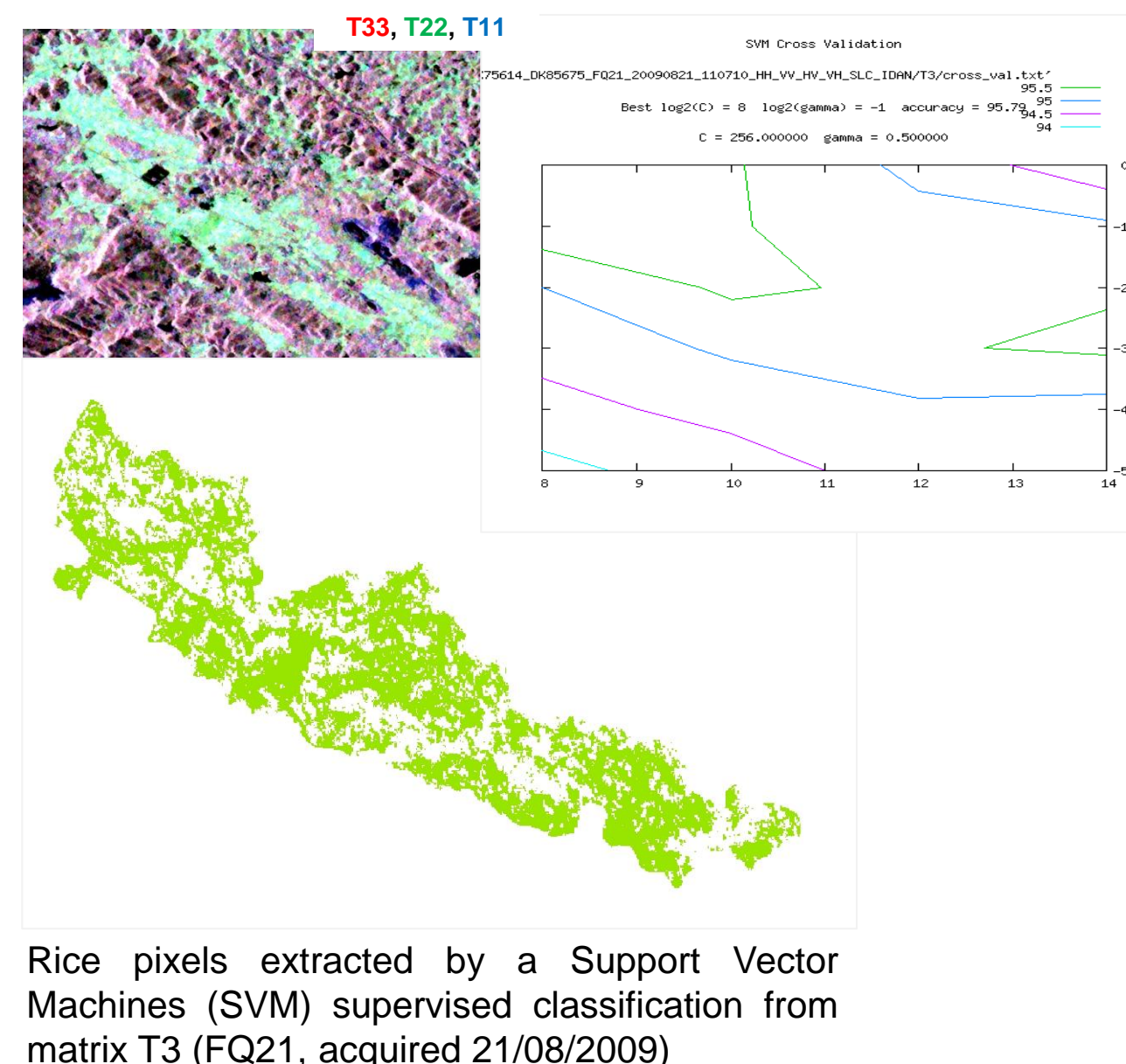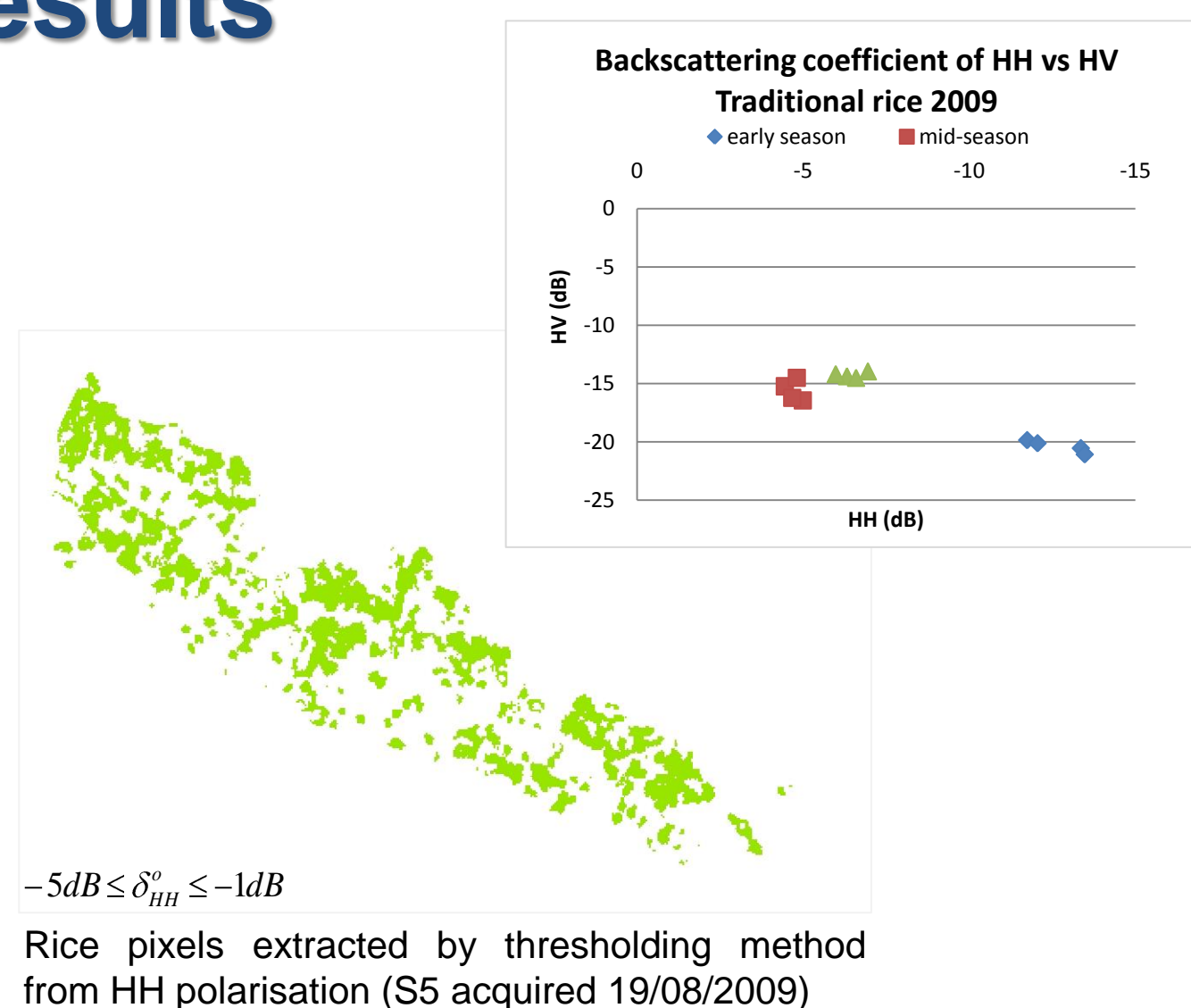
Detection of rice fields, which occupy a large proportion of the river basin area, by using optical images is limited

Method

- Raw Images
  - RADARSAT2 : Dual-pol (S5)
  - RADARSAT2 : Quad-pol (FQ21)

- Image Processing
  - Speckle Filter
  - Geometric Correction
  - Polarimetric Parameters Calculation

- Identification Method
  - Threshold (S5)
  - SVM (FQ21)

- Rice Extracted
  - Rice pixels
  - Rice fields

A thresholding method (*Bouvet et al., 2009; LeToan et al.,1997*) was applied to the dual polarization data in Standard mode (S5) acquired in mid-season. For Fine mode (FQ21) polarimetric data, various polarimetric parameters and decompositions were calculated in order to estimate which of these are most suitable to separate the rice from other crops by using SVM classification.

Results

$-5dB \leq \delta_{HH}^{\circ} \leq -1dB$

Rice pixels extracted by thresholding method from HH polarisation (S5 acquired 19/08/2009)

Rice pixels extracted by a Support Vector Machines (SVM) supervised classification from matrix T3 (FQ21, acquired 21/08/2009)

Rice fields extracted by a Support Vector Machines (SVM) supervised classification from H/A/Alpha decomposition (FQ21, acquired 21/08/2009)

Experimental field

Conclusion

1. Results indicate the capabilities of RADARSAT-2 C-band to identify rice plants and rice fields, and confirm its benefits to distinguish between paddies and other crops.

2. Between the coherency matrix [T3], Freeman-Durden and H/A/α polarimetric decompositions, the matrix [T3] is suitable to identify rice fields by using SVM supervised classification (accuracy : 95%).

3. Thresholding method based on the temporal variation backscattering analysis of HH polarization allows extracting the rice plants in vegetative phase (with a strong signal in mid-crop cycle).

Acknowledgement

References

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- Hoang, K.H, M. Bernier, J-P. Villeneuve, 2008. Les changements de l'occupation du sol dans le bassin versant de la rivière Câu (Viêt-nam). Essai sur une approche diachronique. **Revue Télédétection**. 8(4): 227-236.
- LeToan, T., F. Ribbes, L-F. Wang, N. Floury, K-H. Ding, J.A. Kong, M. Fujita and T. Korosu, 1997. Rice crop mapping and monitoring using ERS-1 data based on experiment and modeling results». **IEEE Trans. Geosci. Rem. Sens**. 35(1): 41-52.