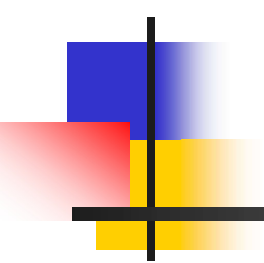
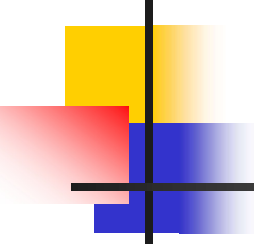


Oil Spill Detection and Classification by ALOS PALSAR at Vietnam East Sea

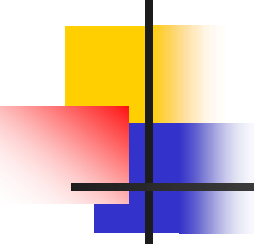


HANG Le Minh, DUONG Nguyen Dinh, Vietnam



OVERVIEW

- INTRODUCTION
- OIL SPILL DETECTION AT SEA BY MICROWAVE REMOTE SENSING
- OIL SPILL DETECTION IN SAR IMAGE
- EXPERIMENTS AND RESULTS
- CONCLUSION



INTRODUCTION

- The National reports on sea pollution in Vietnam East Sea:
 - 12 oil spills and 31 accidents from 1990-1995.
 - The most serious oil pollution in Vietnam East Sea has occurred in the early months in 2007
- In 2007, Vietnam was completely passived and causes and sources of oil spill are still unknown.
- It was unable to define exactly the time oil spill occurred due to lack of proper equipments for inquiring, surveying and detecting the oil spill in early stage at sea.

Oil pollution cleaning



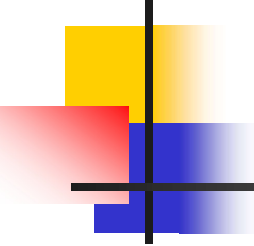
**04/02/2007 – Hoi An –
Da Nang Province**



**28/03/2007 – Vung Tau-
Khanh Hoa Province**

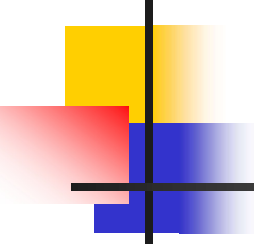


28/03/2007 – The Central region of Vietnam



Purpose of the report

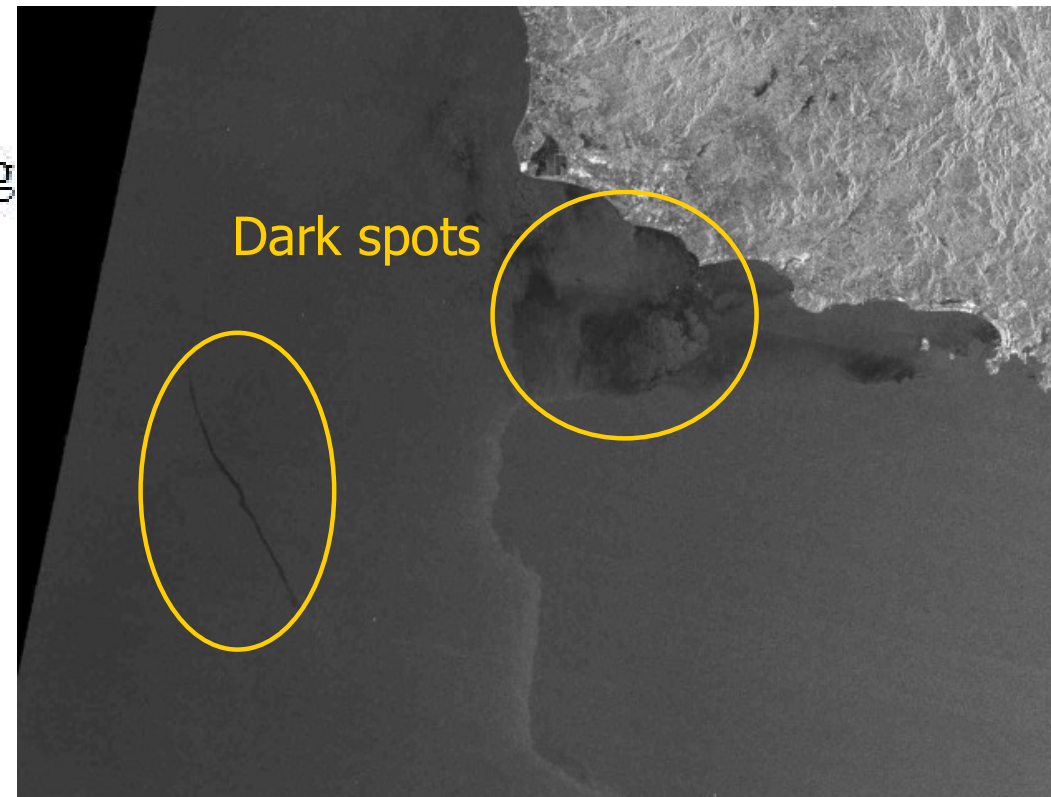
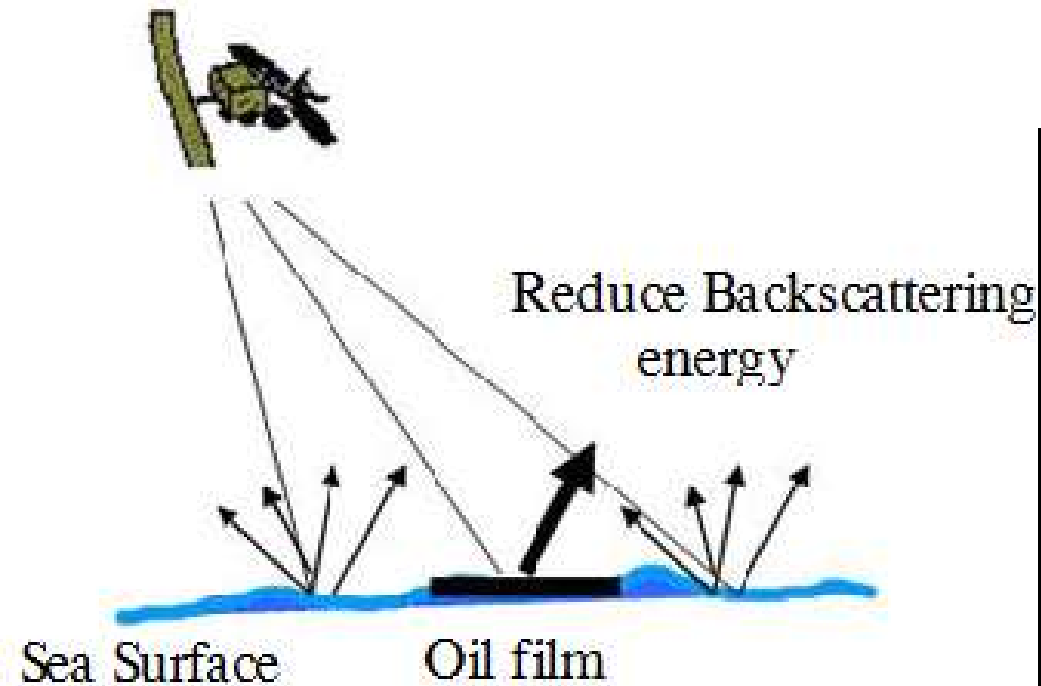
- Giving review on oil spill detection and classification techniques in SAR images
- Selecting a suitable and useable method to detect and classify oil spill at sea in condition of Vietnam.



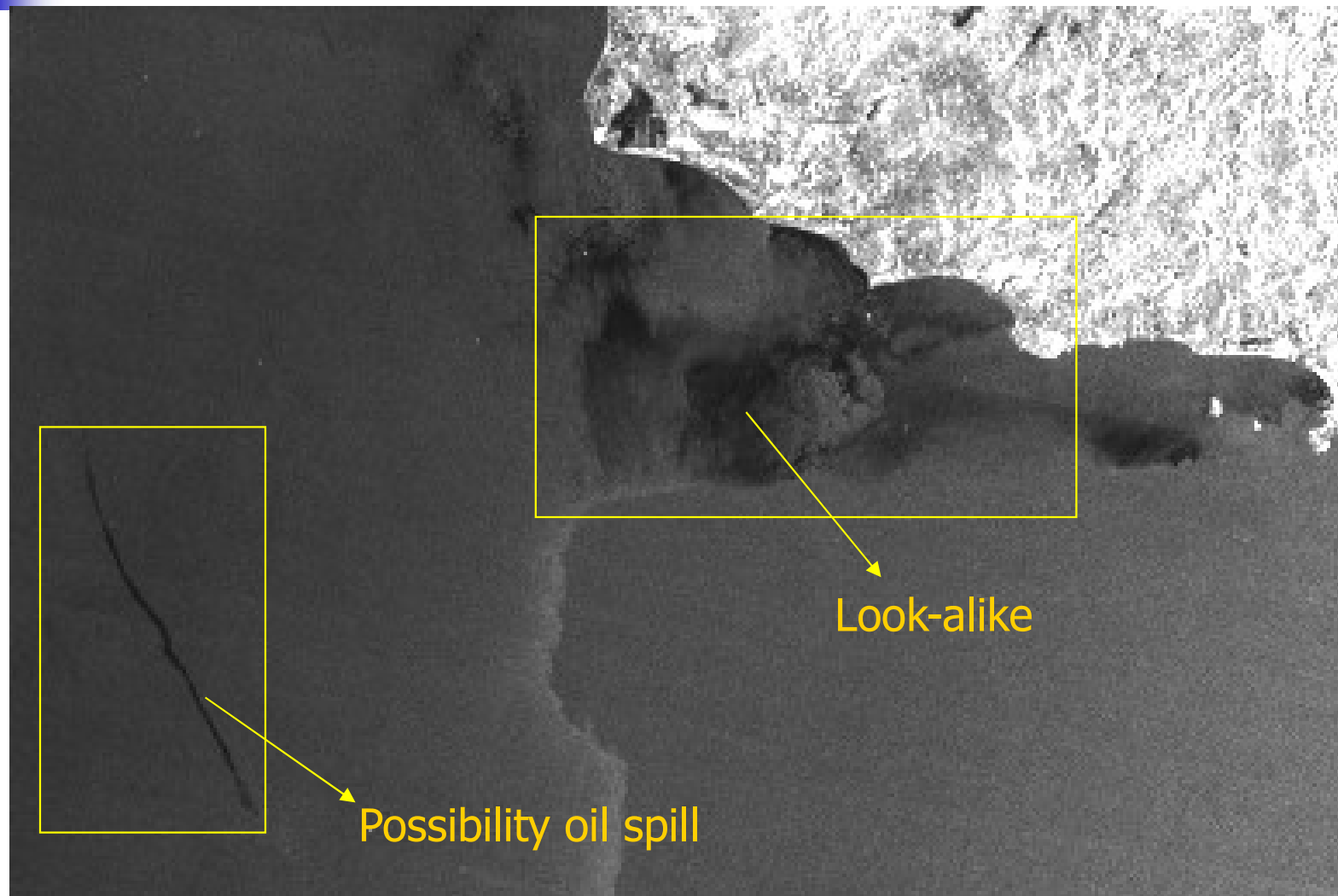
OIL SPILLS DETECTION AT SEA BY MICROWAVE REMOTE SENSING

- Synthetic Aperture Radar (SAR) used for monitoring oil pollution systems due to its wide area coverage and day and night and all weather capabilities
- Optical sensors have no such capabilities like microwave sensors

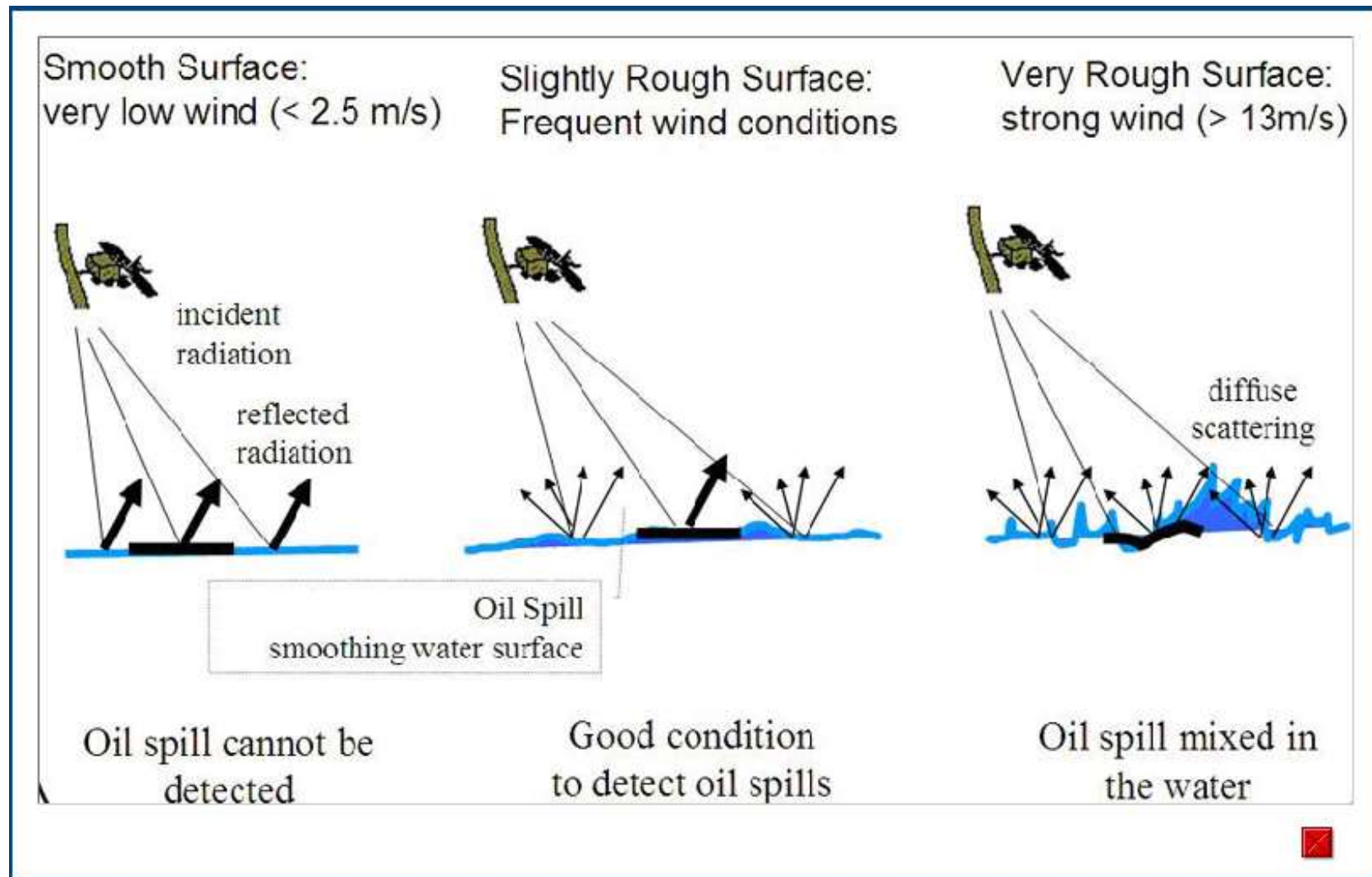
PRINCIPLE OF OIL SPILLS DETECTION

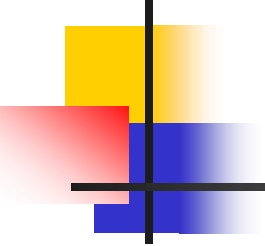


OIL SPILLS DETECTION AT SEA BY MICROWAVE REMOTE SENSING



WIND CONDITION FOR OIL SPILL DETECTION

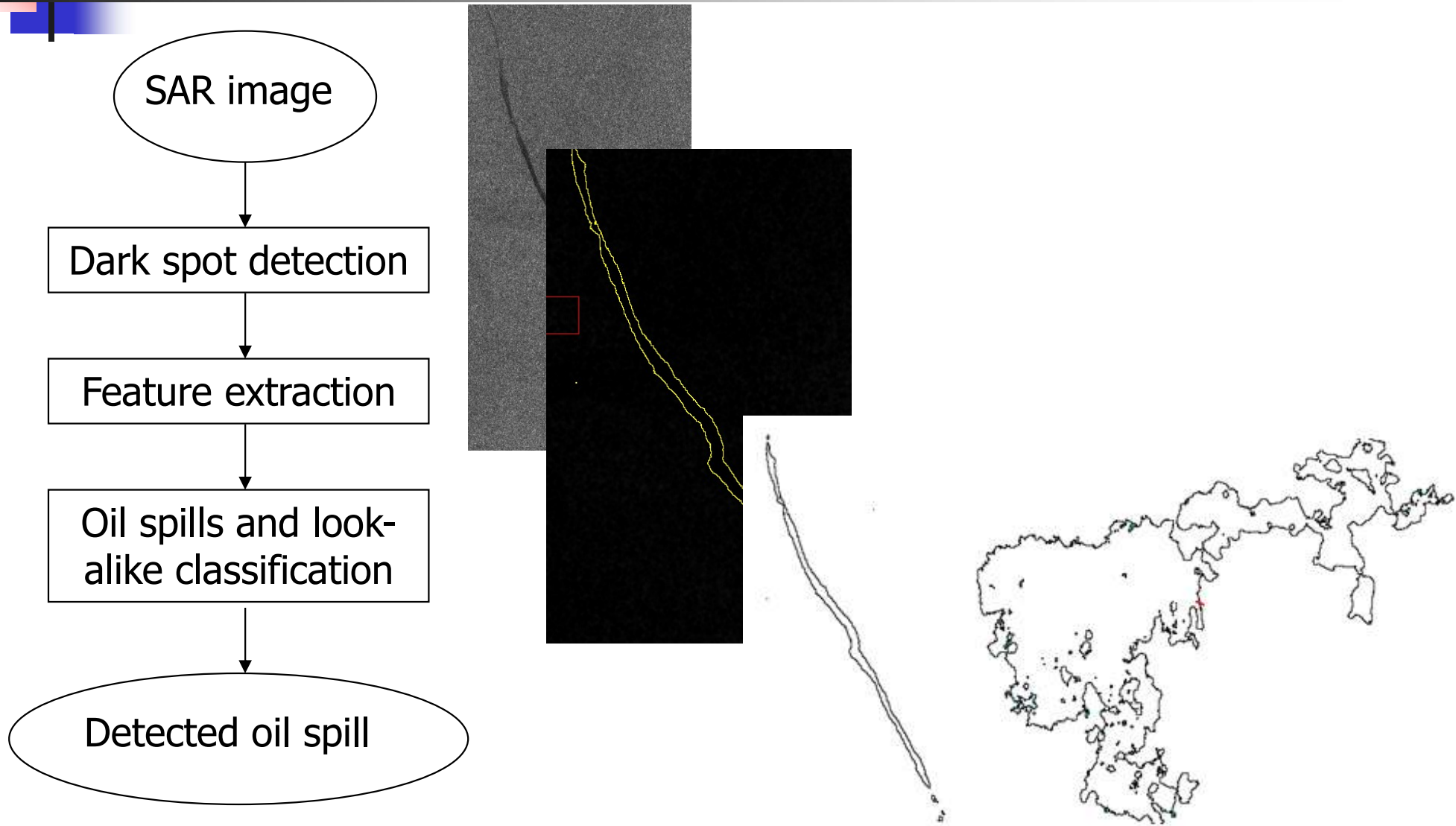


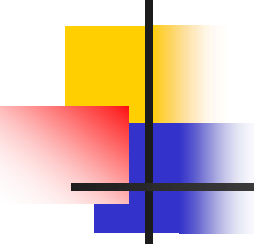


OIL SPILL DETECTION IN SAR IMAGE

- Two main steps:
 - Detection of dark spots
 - Classification of the slicks
- Methods: Manual, semi or fully automatic detection

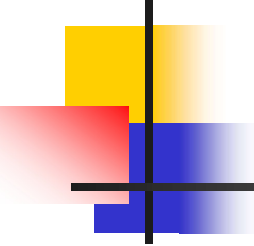
Automatic techniques for oil spill detection in SAR image





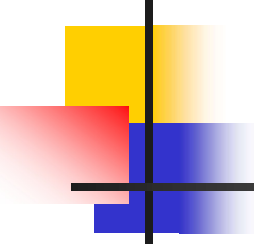
Algorithm for detecting dark spots

- By automatic threshold
- By Hidden Markov Chain (HMC) algorithm
- By Constant False Alarm Rate (CFAR) algorithm



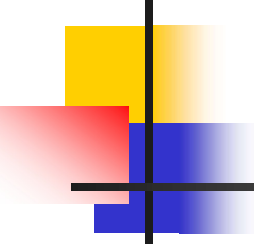
Feature extraction

- Geometry and shape features of the segmented regions
- Physical characteristics of the backscatter level of the spot
- Spot contextual features: nearby land or a bright spots
- Fractal texture description (D)



Classification methods

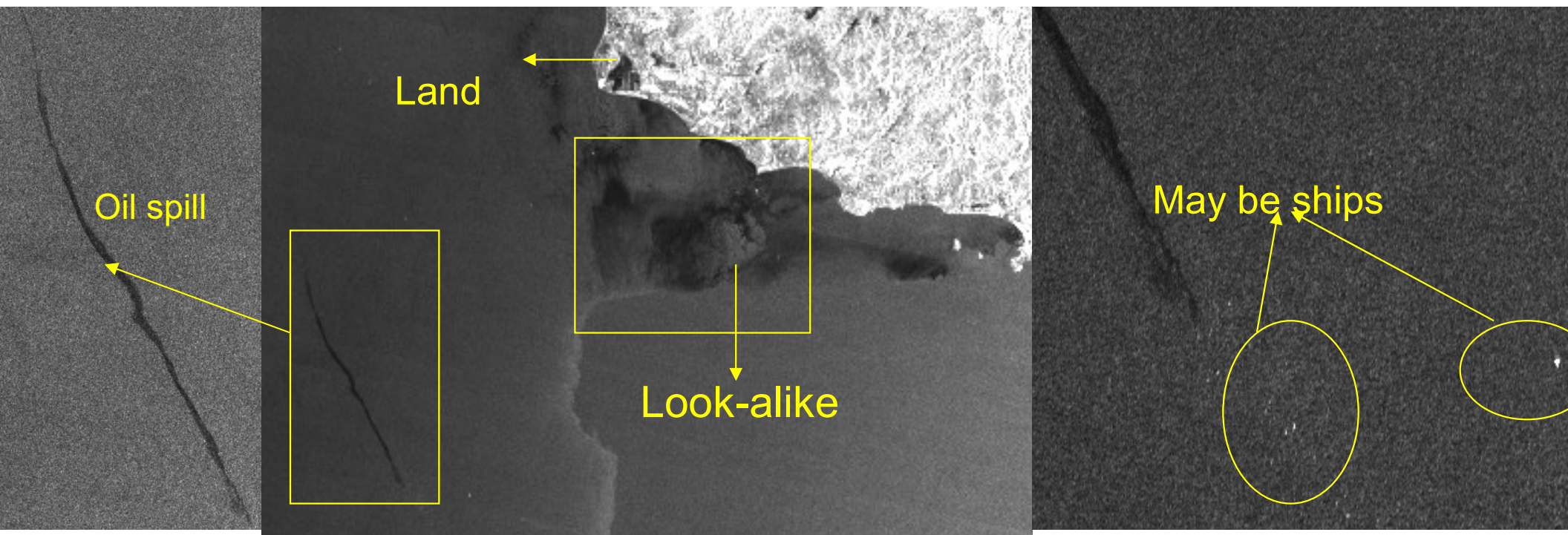
- Artificial Neural Network
- Accuracy of classified results between 82% and 94%
- This result has been achieved using different dataset and algorithms



EXPERIMENTS AND RESULTS

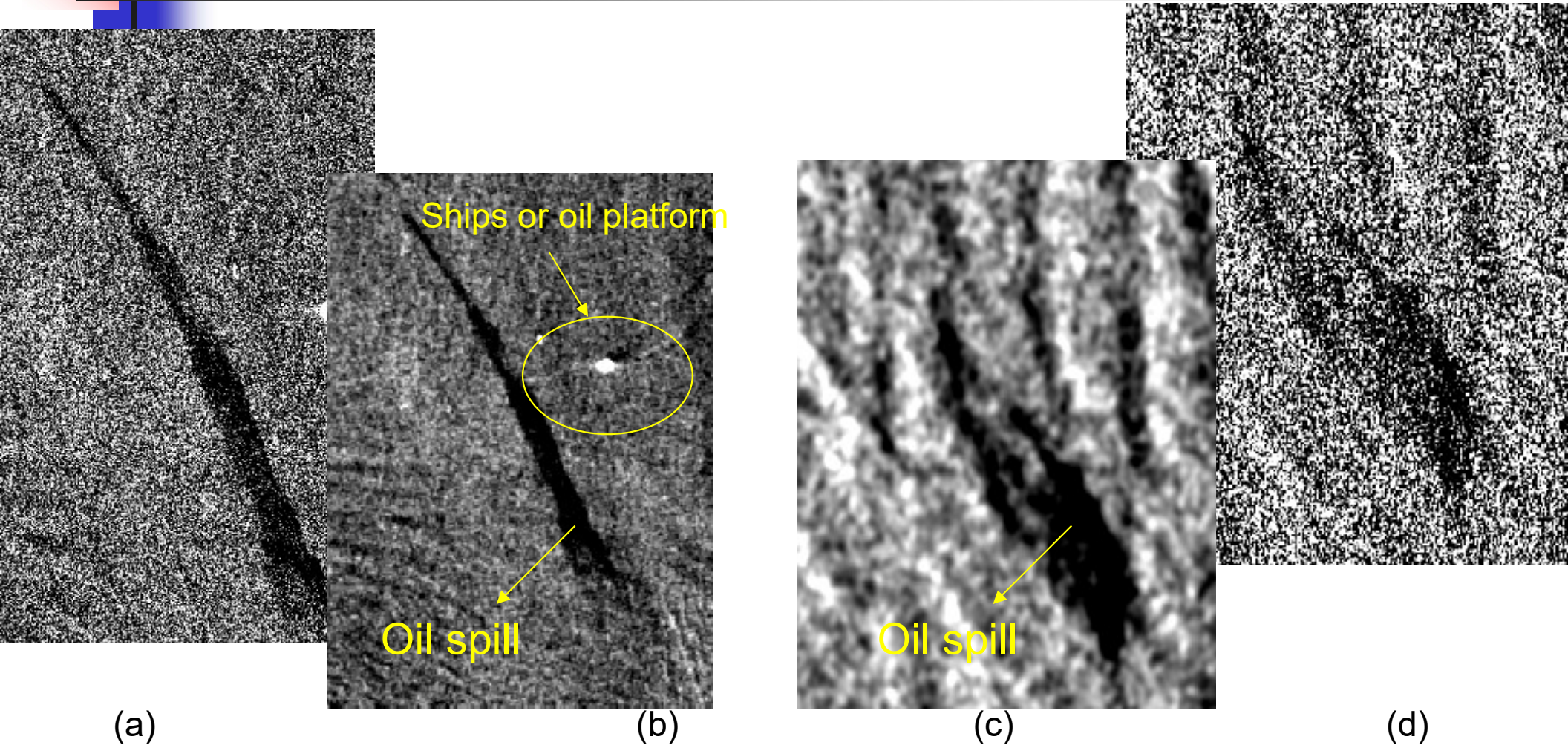
- ALOS PALSAR: Level 4.2-ERDAS with spatial resolution 100m, 4 looks and polarization HH
- 3 ALOS PALSAR images on 8/03/2007, 29/03/2007 and 18/04/2007
- Our results are studied by visual interpretation and semi-automatic method on ALOS PALSAR images

Result of visual Interpretation on ALOS PALSAR



Detection of oil spill in 08/03/2007 image

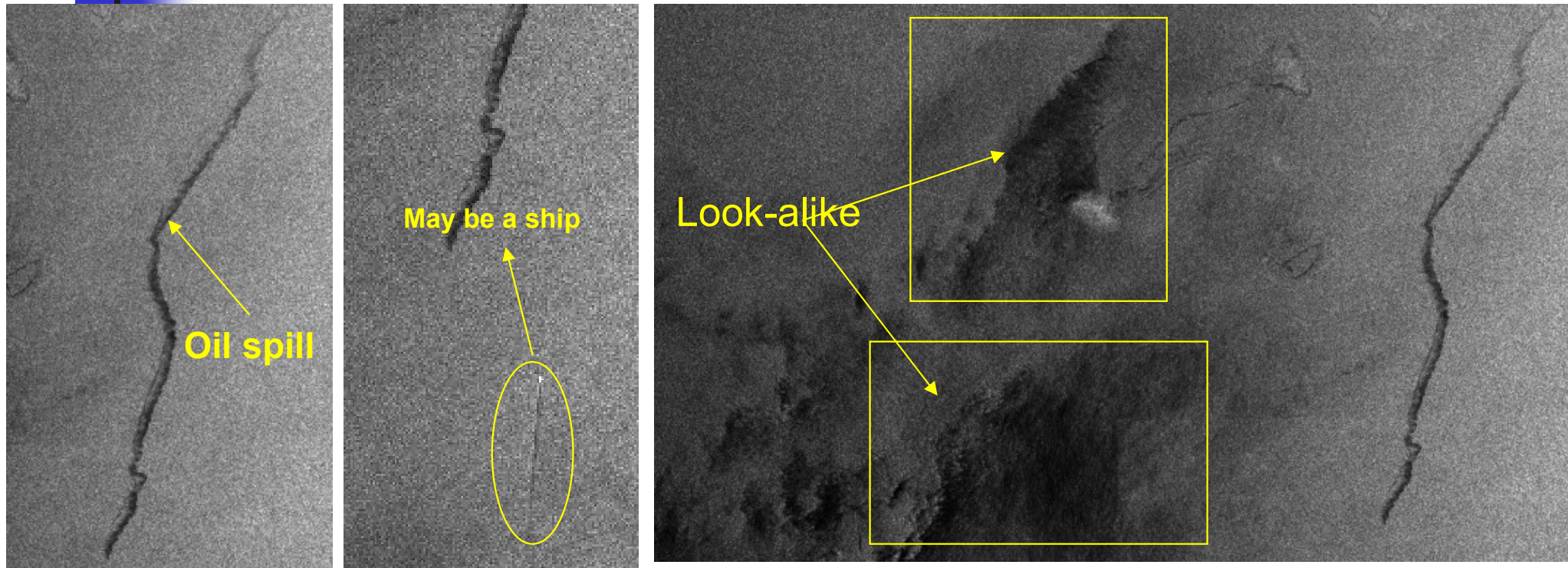
Result of visual Interpretation by ALOS PALSAR



Detection of two oil spills on 29/03/2007 image.

(a) and (d) original data. (b) and (c) filtered by LEE algorithm (window 7x7)

Result of visual Interpretation by ALOS PALSAR



Detection of oil spill on 18/04/2007 image

Results by semi-automatic technique

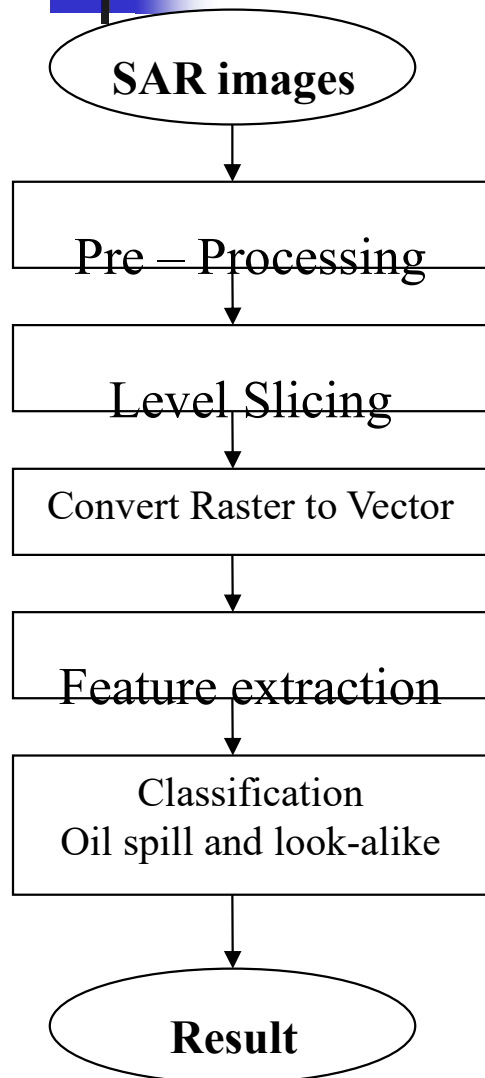
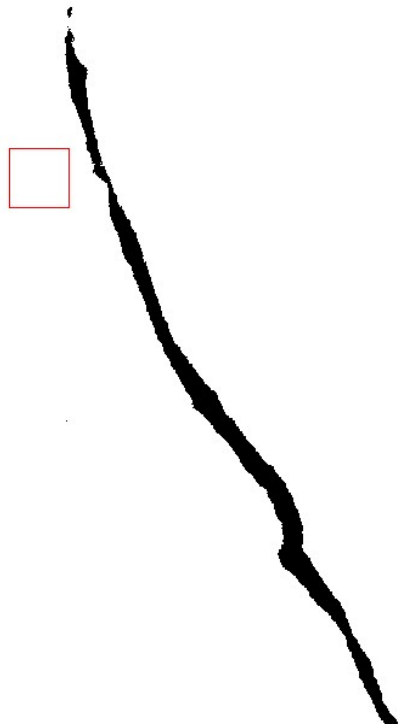


Table 1

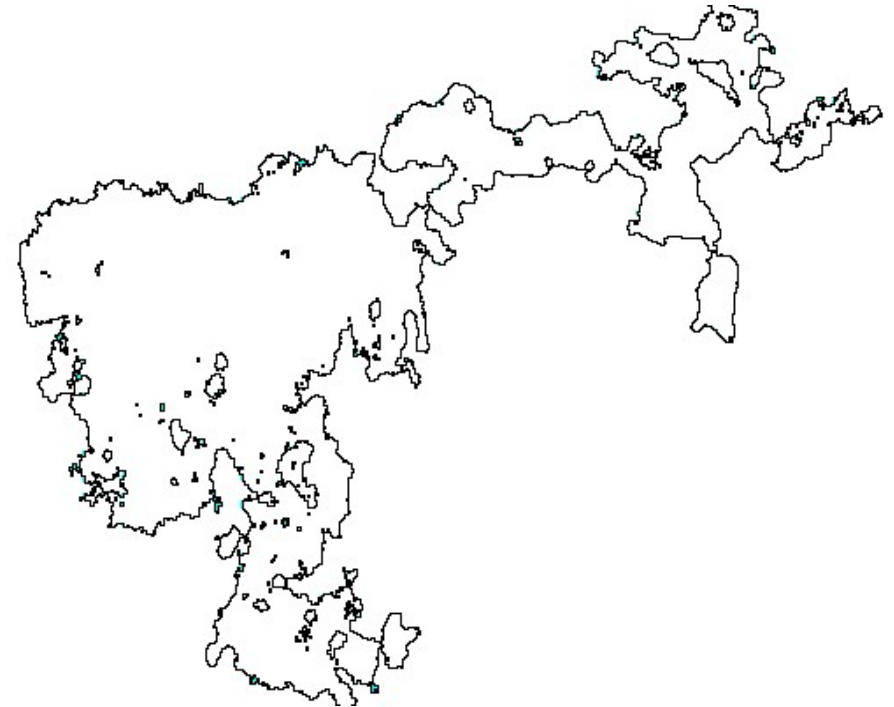
Oil spills detection and classification in ALOS PALSAR images

Images	No	Area (m ²)	P (m)	Complex (C)	Shape factor	Results
8/3/07	1	25095000	111800	6.30	36.62	Oil spill
8/3/07	2	119965000	357400	9.21	1.36	Look - alike
29/3/07	3	58694	6144	7.16	12.57	Oil spill
29/3/07	4	7310	986	3.25	1.23	Look-alike
18/4/07	5	25492	4726	8.35	41.43	Oil spill

Results by semi-automatic technique



Level Slicing



Contouring and Classification

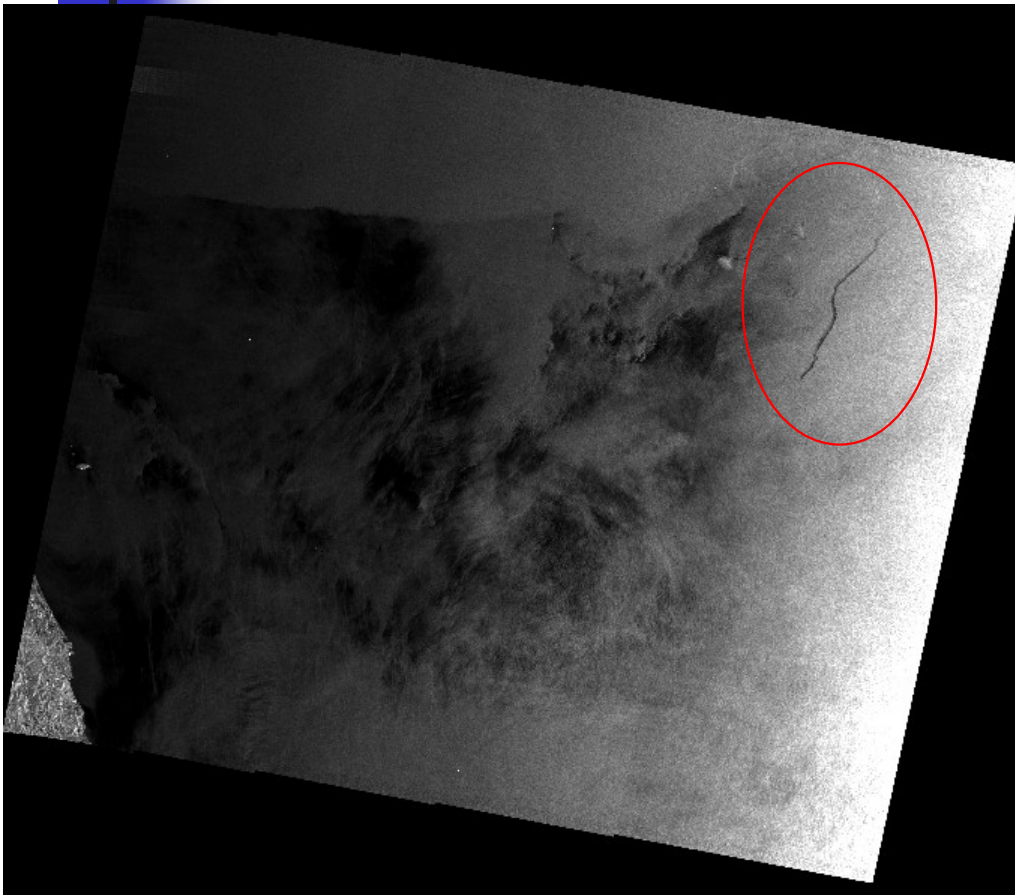
Detection and classification of oil spills on 8/3/2007 image

Results by semi-automatic technique

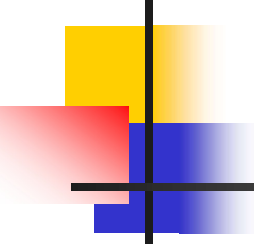


Detection and classification of oil spills on 29/3/07 image.
(a) and (c) level slicing. (b) and (d) contouring and classification.
(c) and (d) an oil spill has not been detected.

Results by semi-automatic technique

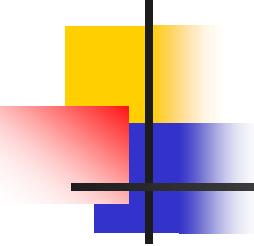


Detection and classification on 18/04/2007 image.



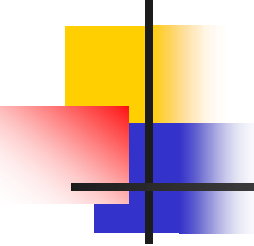
CONCLUSION

- ALOS PALSAR with spatial resolution of 100m resolution: used for detection and classification of large size oil spill at sea.
- Level slicing which is quite simple method can be used and demonstrate quite good results
- To improve the accuracies, there is a need to find out geometry, shape features and backscattering levels AND integration of GIS databases, wind speed, position of lands to achieve better oil spill detection result.



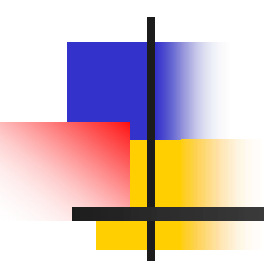
CONCLUSION

- The next our research:
 - Automatic adaptive threshold, vectorization and calculated geometry features
 - The method for discrimination between oil spill and look-alike
 - Built a software program for detecting and classifying oil spill in the sea in SAR image



ACKNOWLEDGEMENT

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**THANK YOU FOR
YOUR ATTENTION**
