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**ALLER-RETOUR
SEGMENTATION/CLASSIFICATION
DES IMAGES POLARIMÉTRIQUES SAR**

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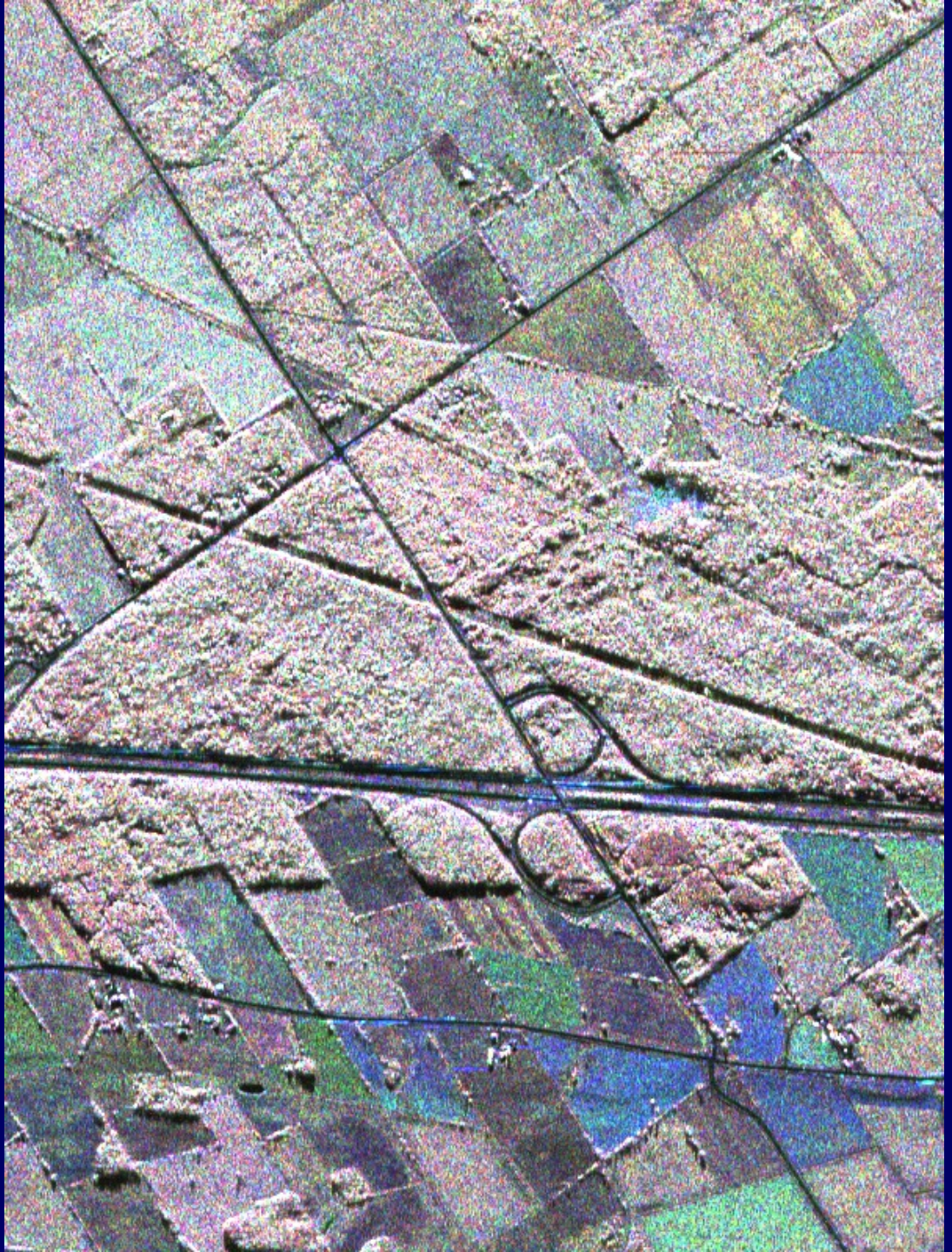
Centre canadien de télédétection
Ressources naturelles Canada

ALLER-RETOUR SEGMENTATION/CLASSIFICATION DES IMAGES POLARIMÉTRIQUES SAR

- Difficulté de la segmentation
- Difficulté du regroupement (classification non-supervisée)
- Regroupement de segments
- Mean-Shift et regroupement hiérarchique
- Segmentation basée sur le regroupement

La segmentation
est une tâche
difficile

Séparation de
l'image en régions

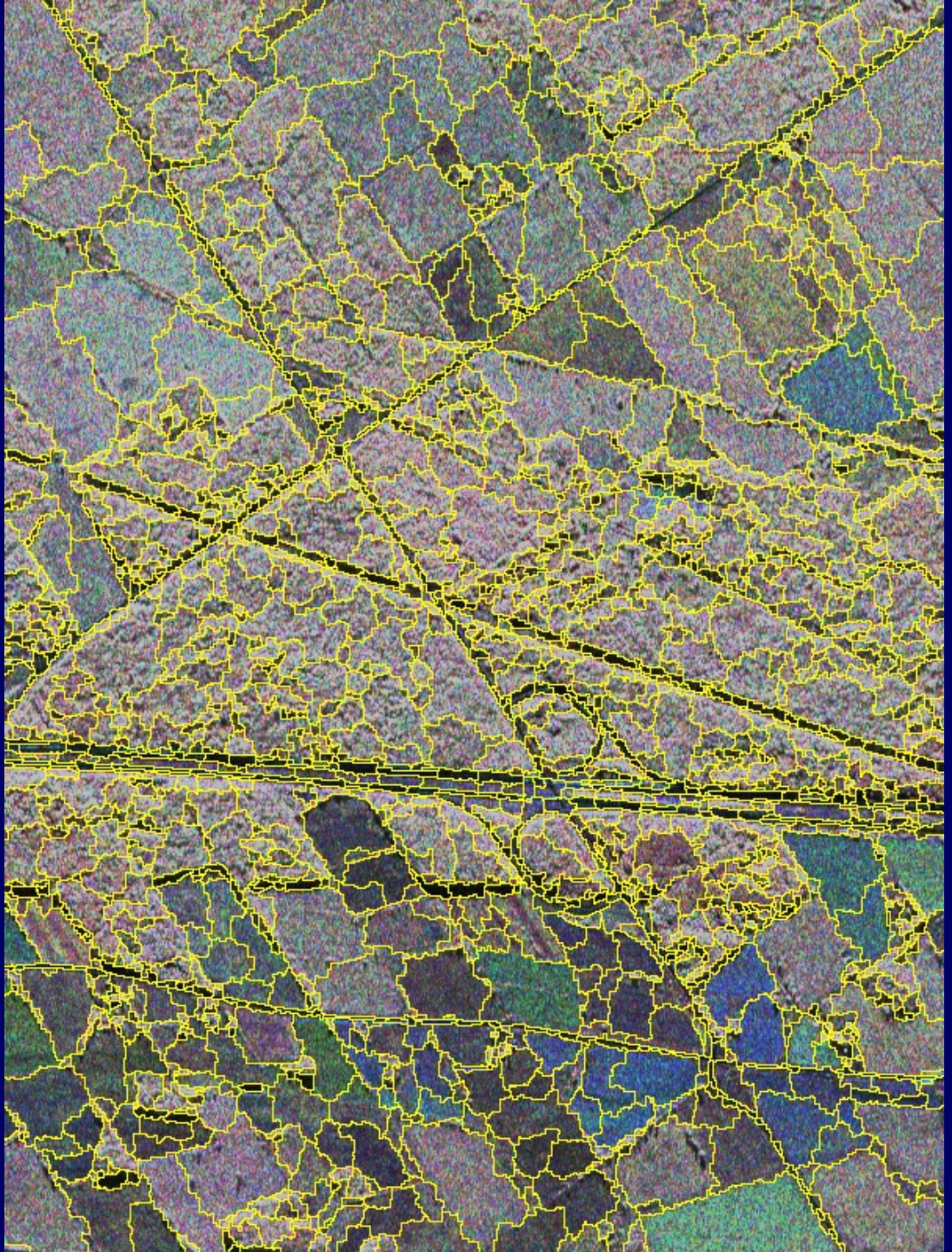


Combien de
régions ?

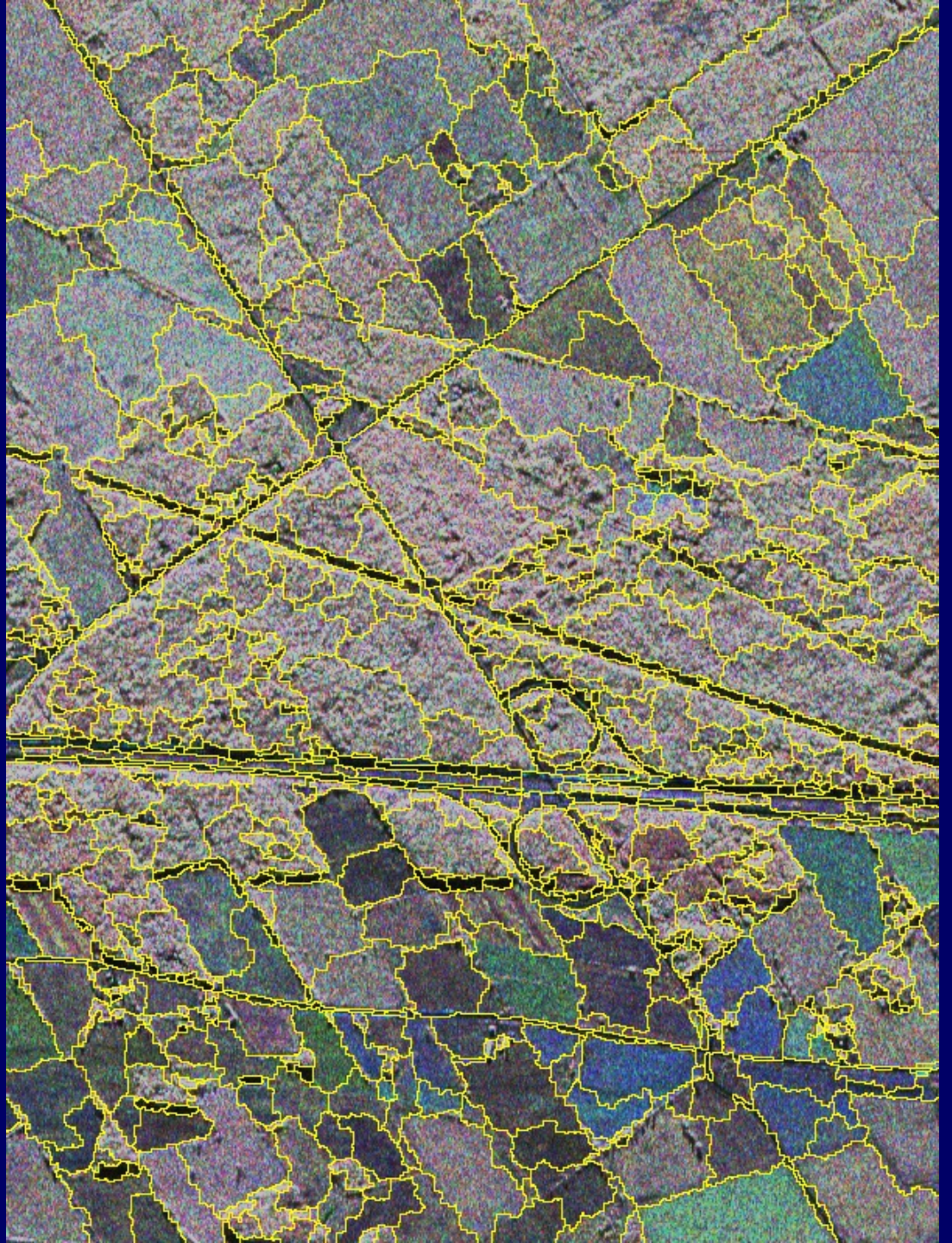
Les premières
fusions sont faciles
De 600x800 pixels
à 48,000 segments.



2000 régions

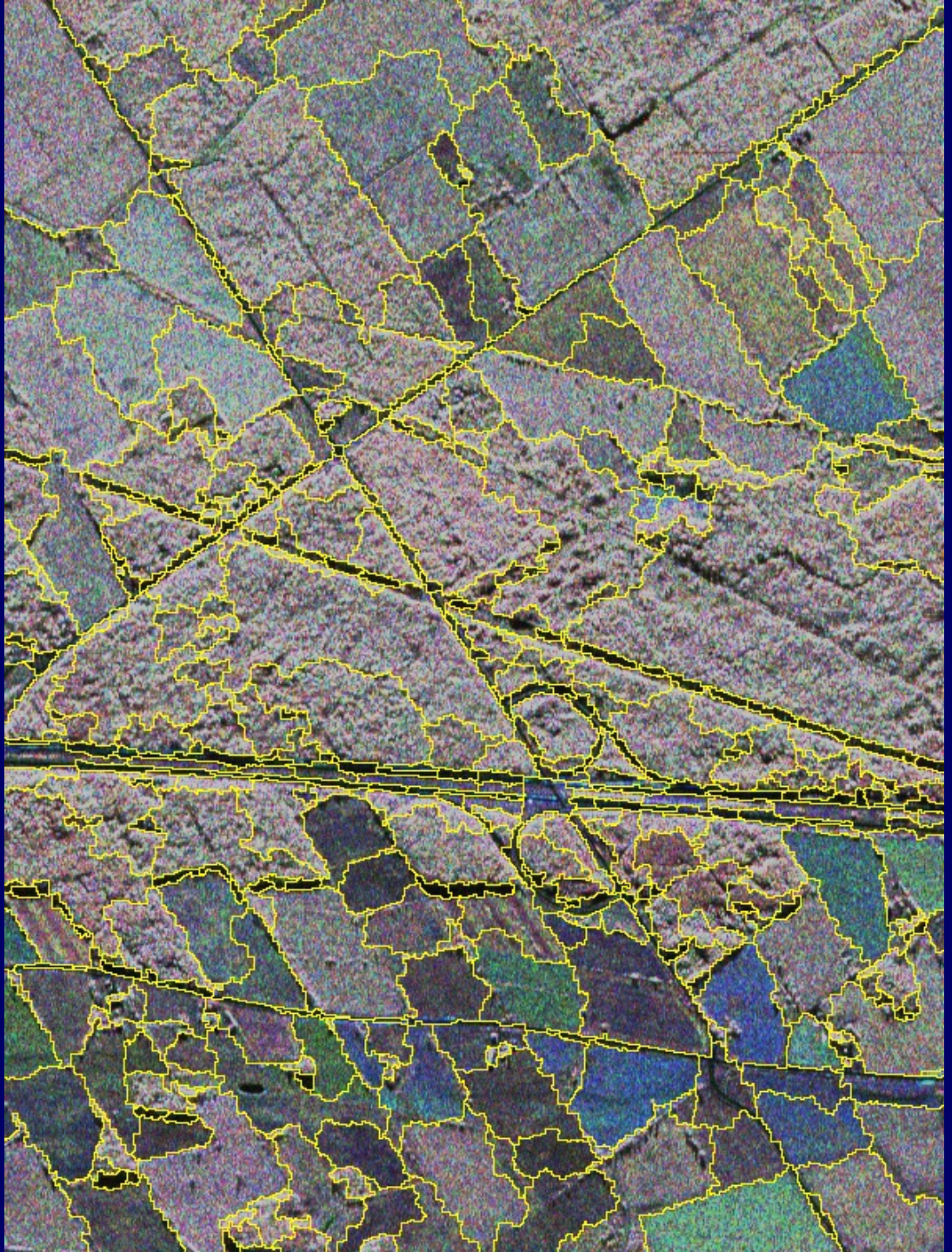


1000 régions



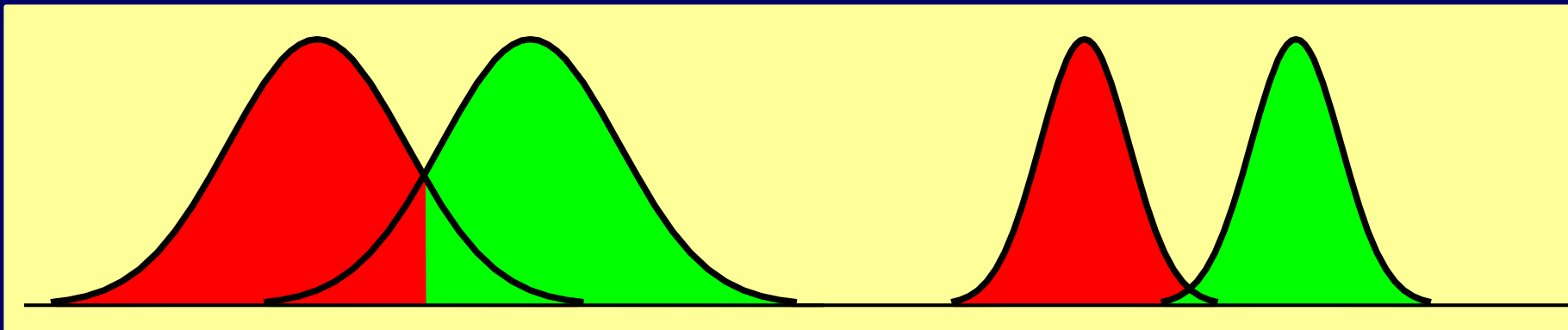
500 régions

Comment
améliorer
les résultats ?

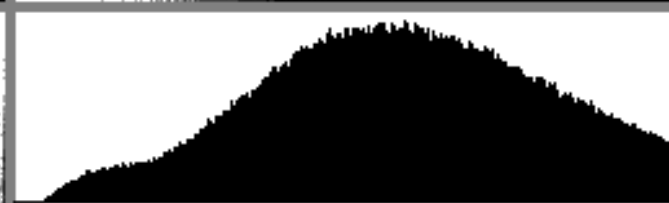
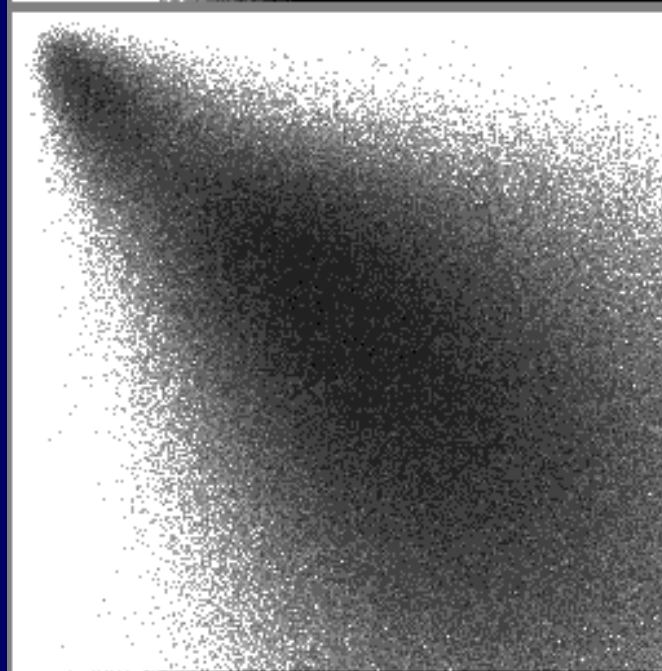
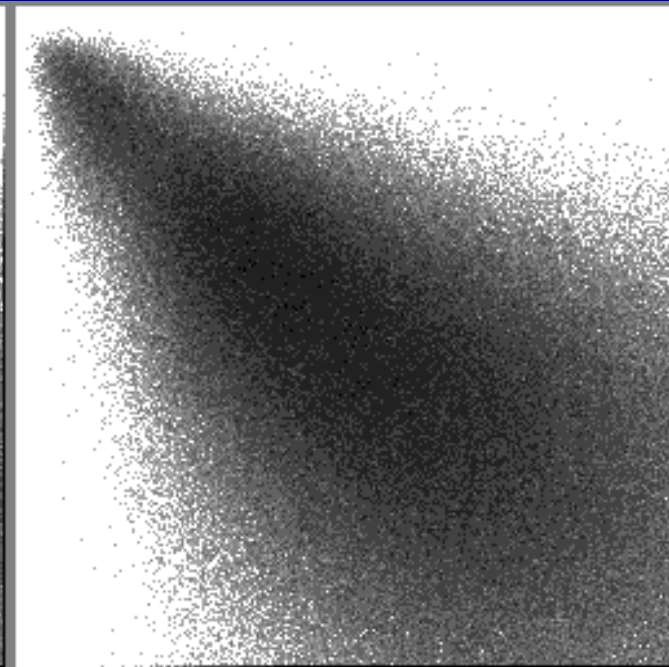
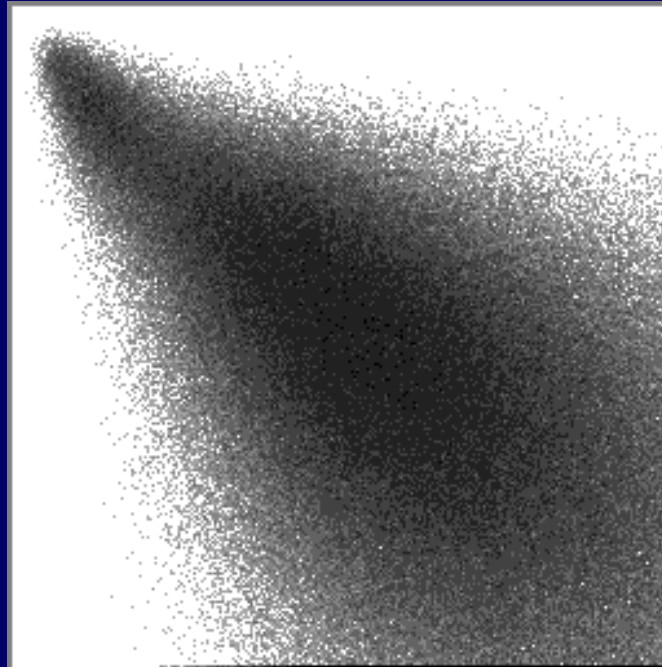


COMBINAISON DE LA SEGMENTATION ET DE LA CLASSIFICATION

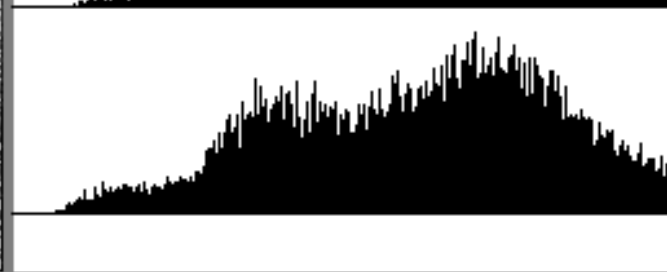
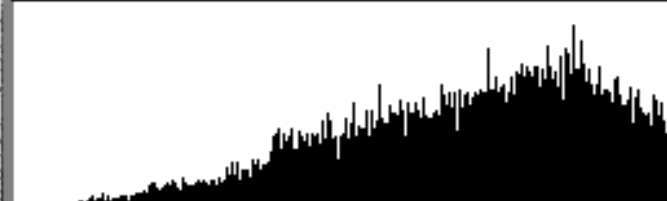
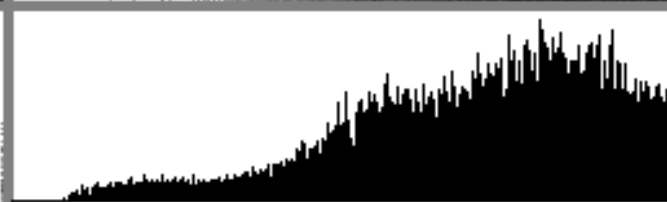
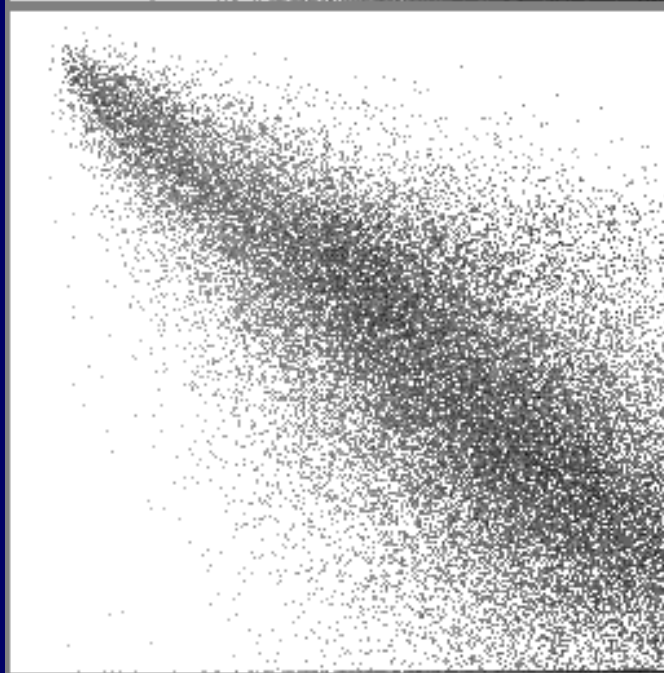
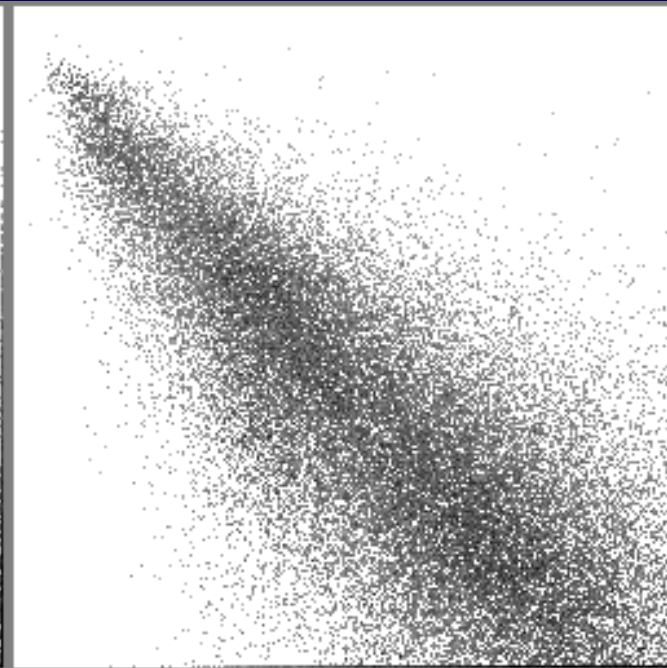
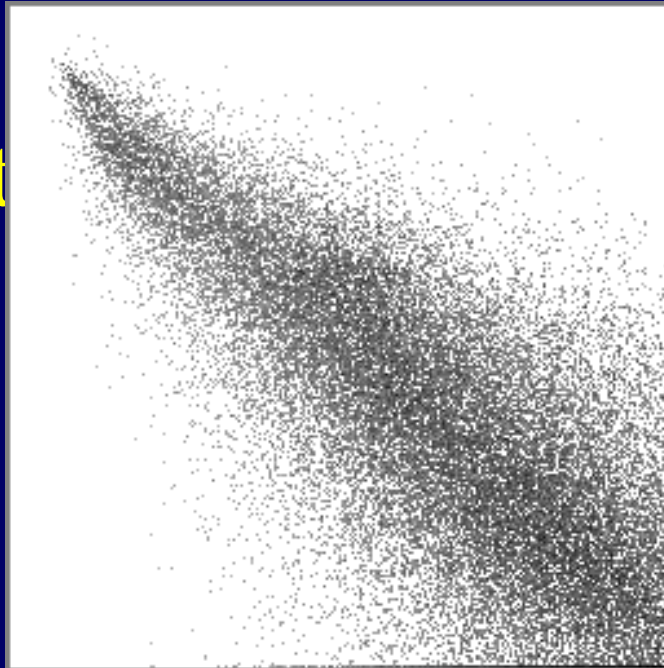
- Regroupement : classification non supervisée
- Formation de groupes (clusters)
- Segmentation : contrainte de proximité
- Le regroupement est une tâche difficile



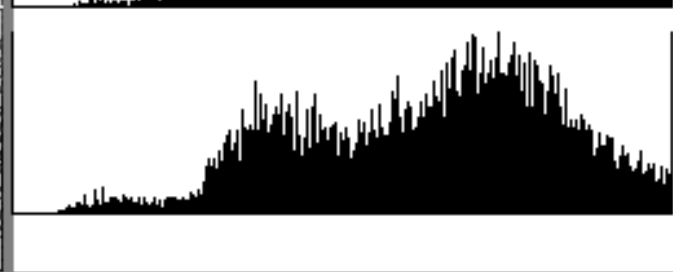
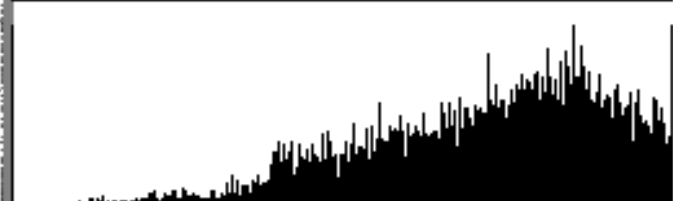
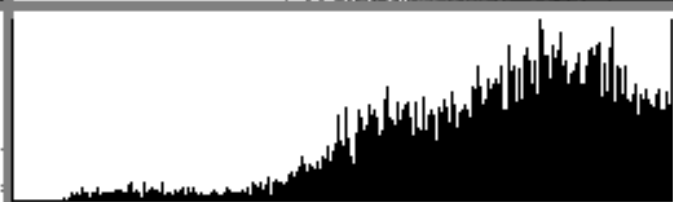
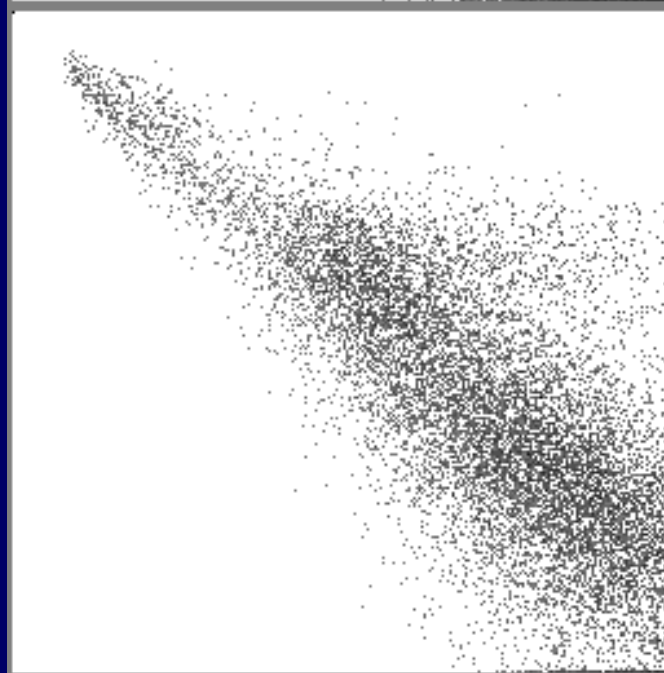
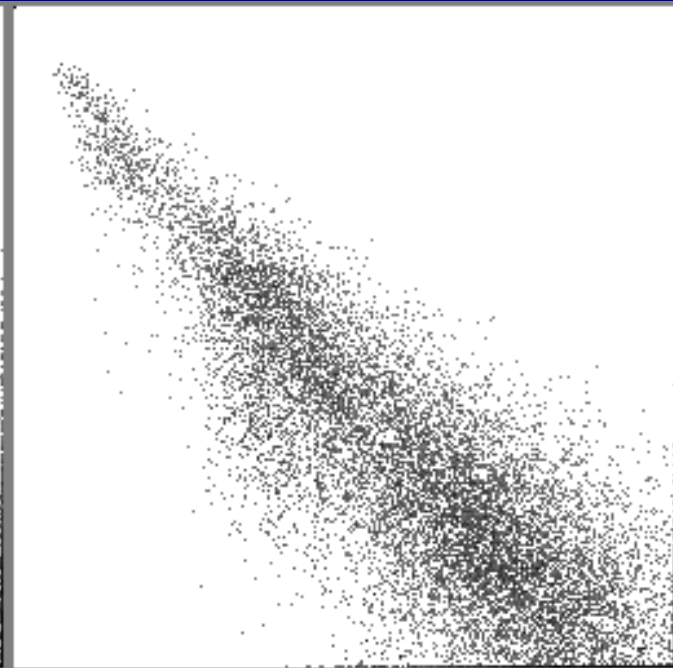
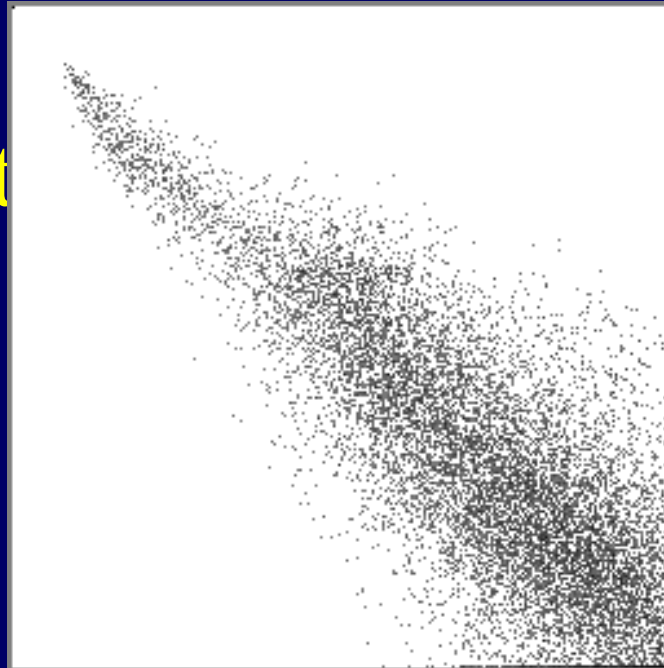
Le
regroupement
est une tâche
difficile



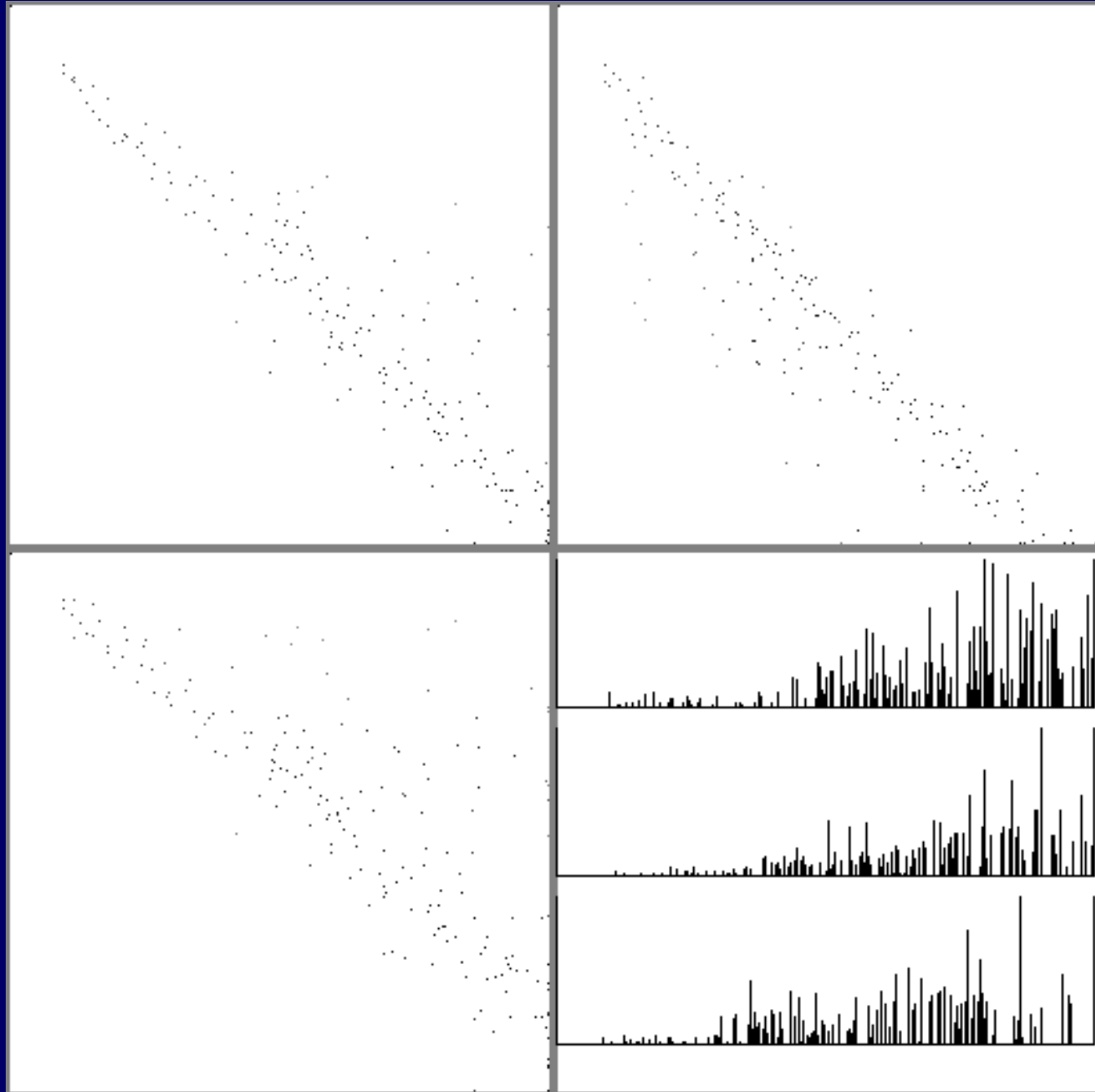
Regroupement de segments



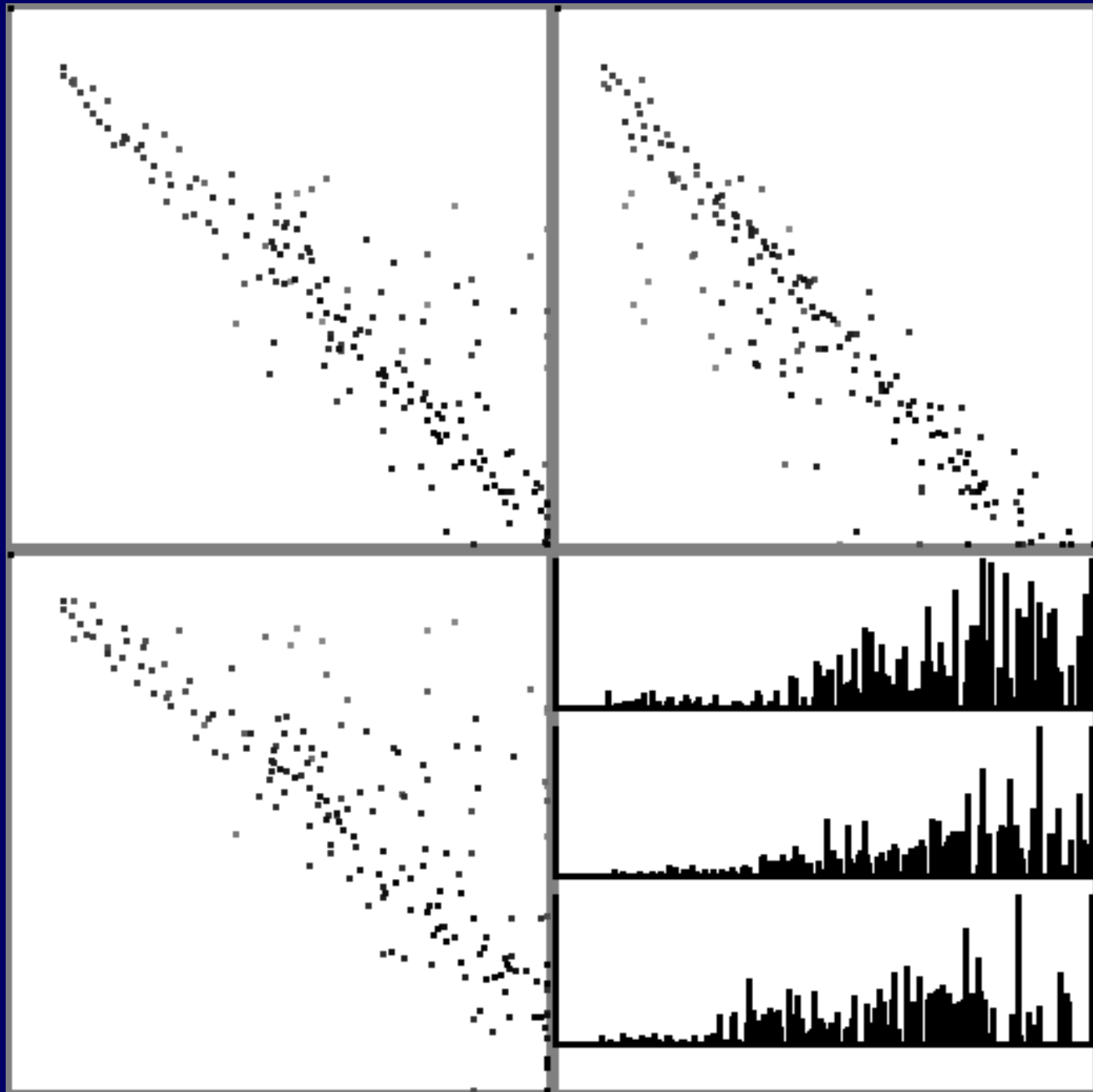
Regroupement des plus gros segments



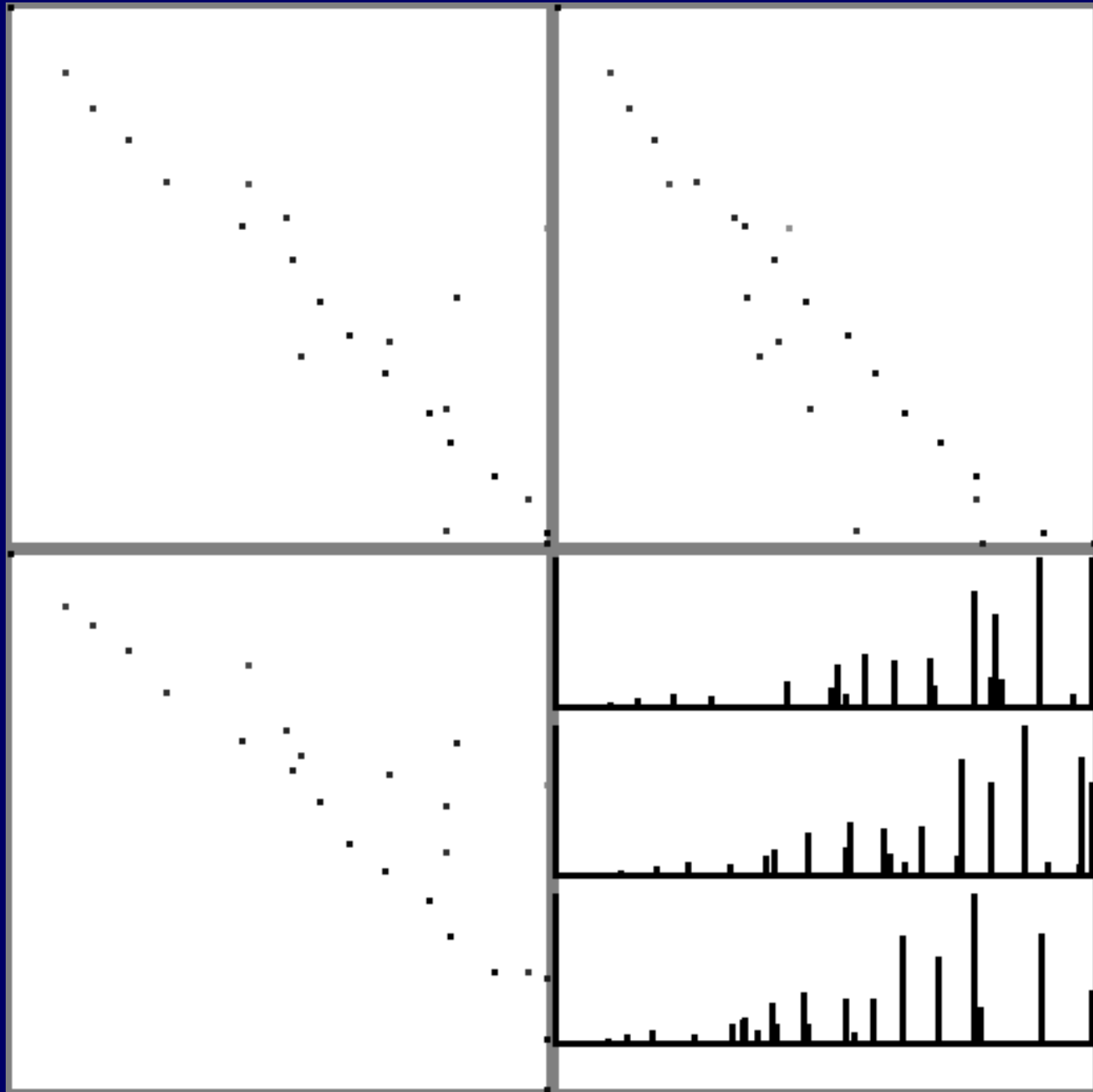
200 groupes



200 groupes



25 groupes



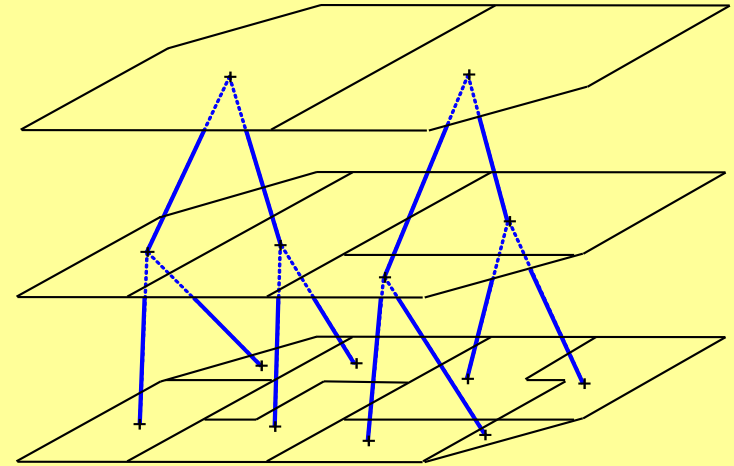
COMMENT LA SEGMENTATION PEUT AIDER LE REGROUPEMENT

- Regroupement de segments — réduction du bruit
- Sélection des plus gros segments (10 pixels et plus)
- Combinaison de techniques hiérarchiques et itératives
- Technique "mean shift"
— généralisation des K centres

Segmentation hiérarchique

Image polarimétrique SAR multi-vue

$$C = \frac{1}{n} \begin{bmatrix} \sum hh \ hh^* & \sum hh \ hv^* & \sum hh \ vv^* \\ \sum hv \ hh^* & \sum hv \ hv^* & \sum hv \ vv^* \\ \sum vv \ hh^* & \sum vv \ hv^* & \sum vv \ vv^* \end{bmatrix}$$

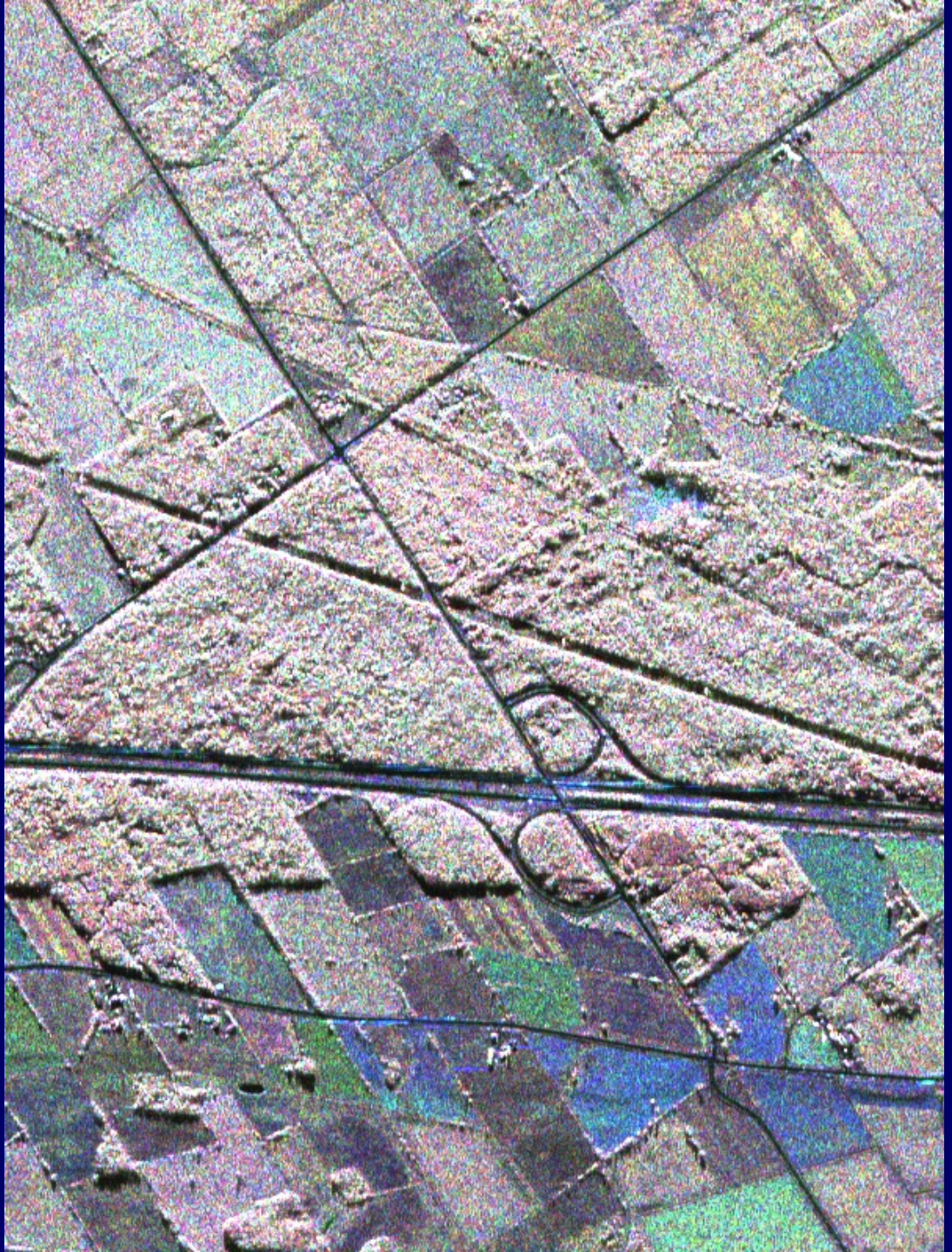


Arbre des segments

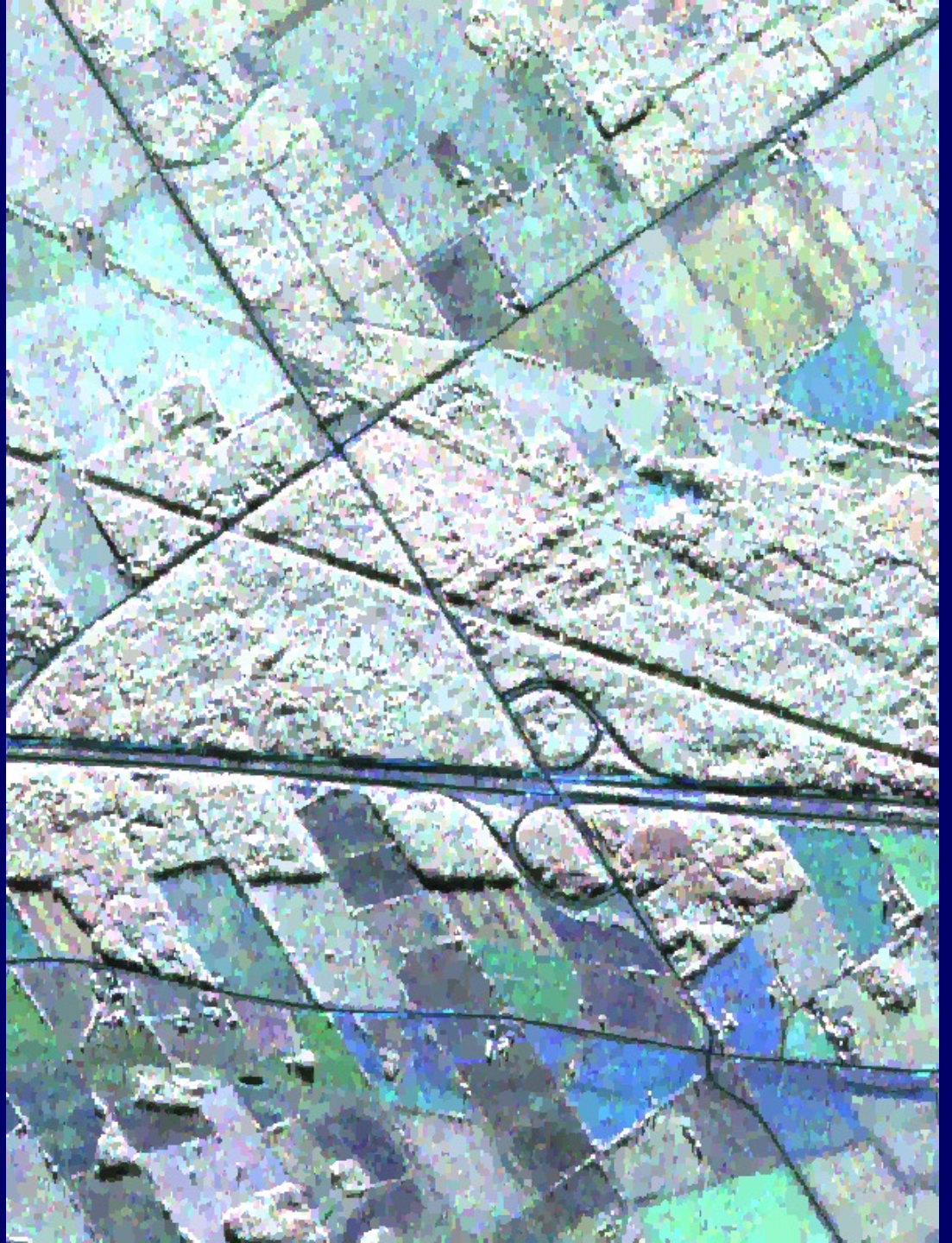
Choix des fusions pour maximiser la vraisemblance

$$\begin{aligned} \Delta &= LML(s_i) + LML(s_j) - LML(s_i \cup s_j) \\ &= -n_{si} \ln |C_{si}| - n_{sj} \ln |C_{sj}| + (n_{si} + n_{sj}) \ln |C_{si \cup sj}| \end{aligned}$$

Image PolSAR
600x800
9 vues
Région de
Mer Bleu (Ottawa)



Approximation
par 48,000
segments



14,787 segments
de 10 pixels et
plus



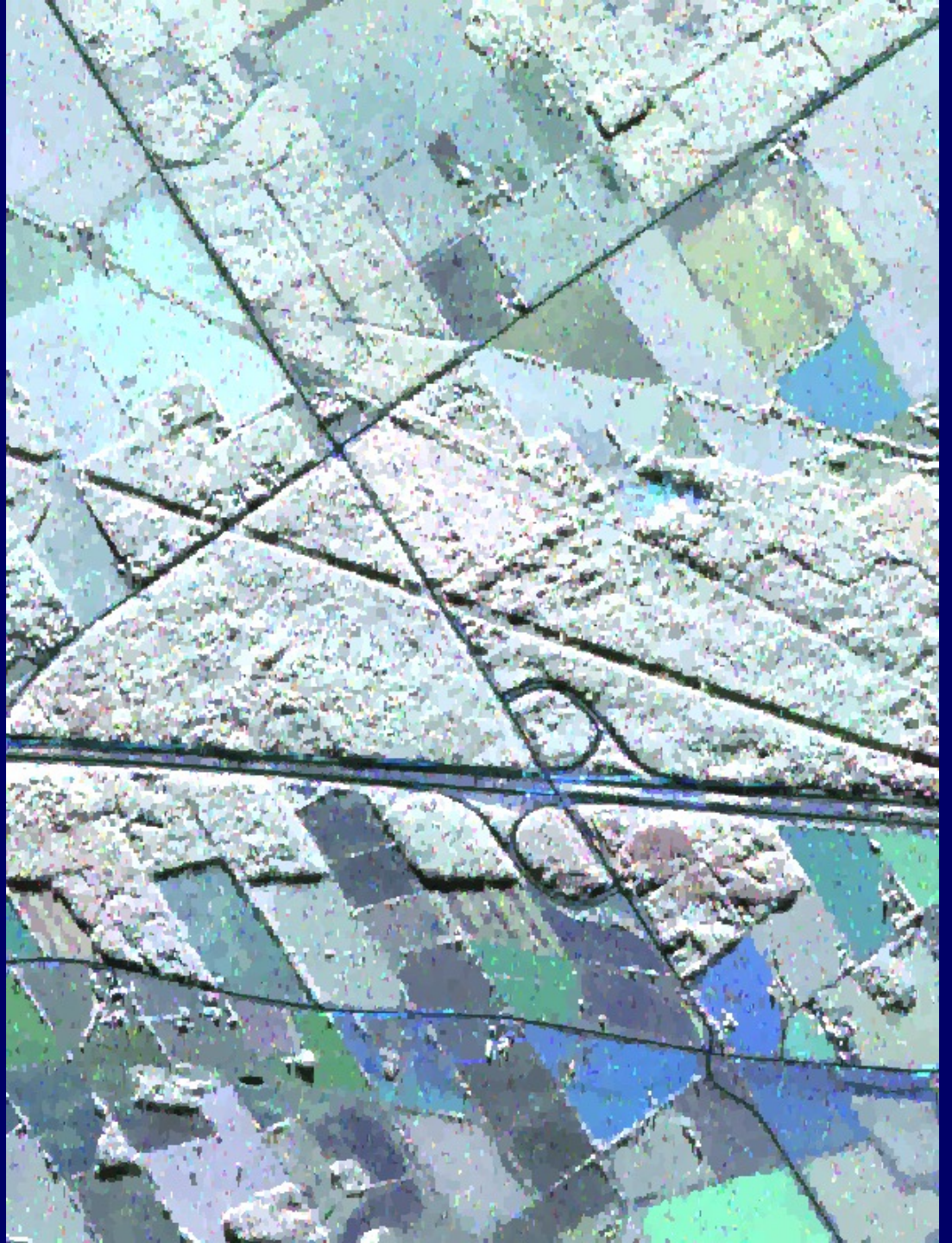
Mean-Shift
sur les gros
segments

Séparation de
l'image en régions

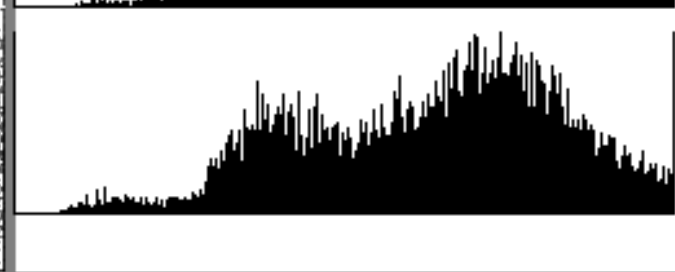
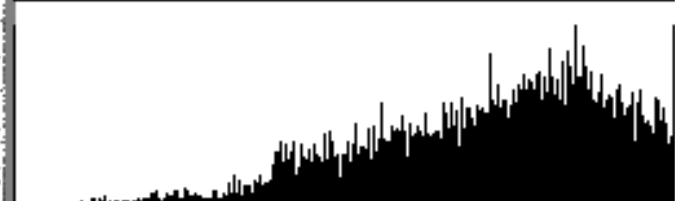
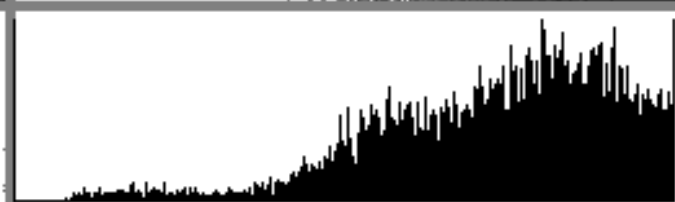
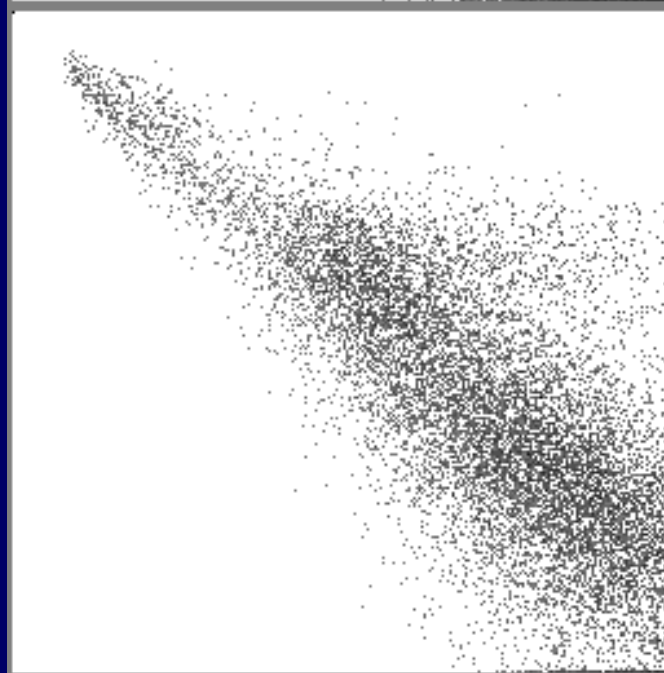
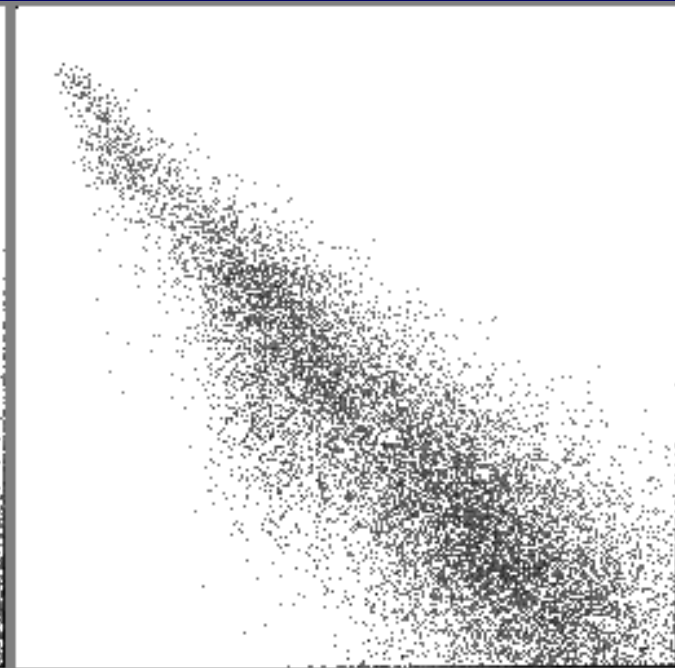
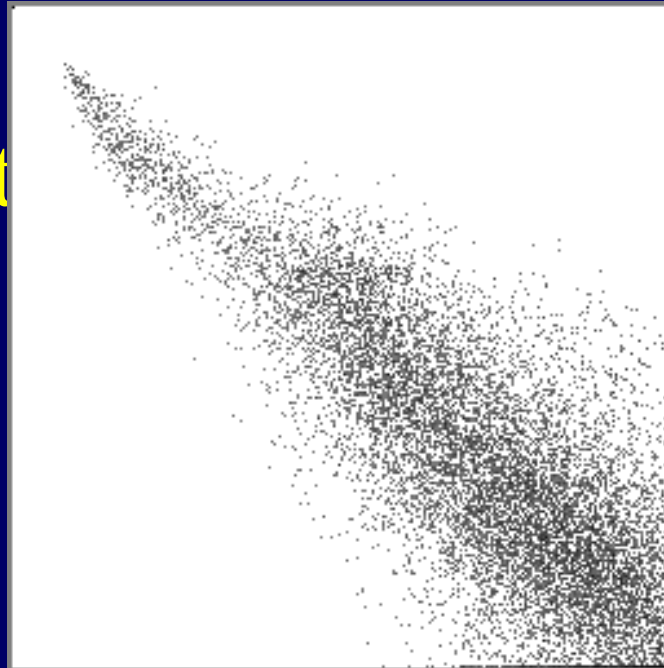


Mean-Shift
sur les gros
segments

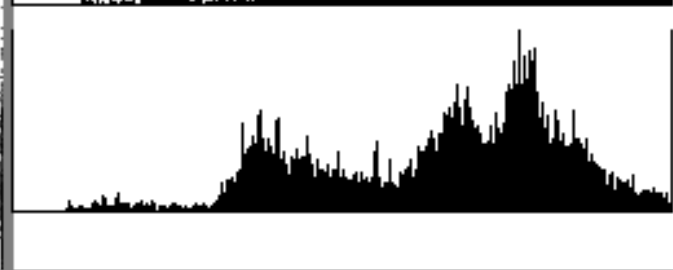
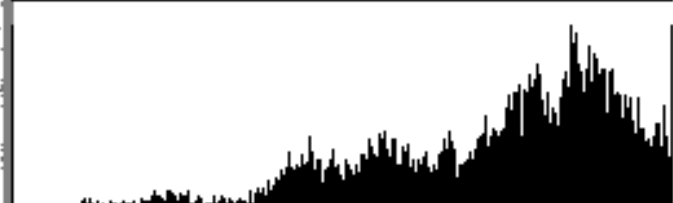
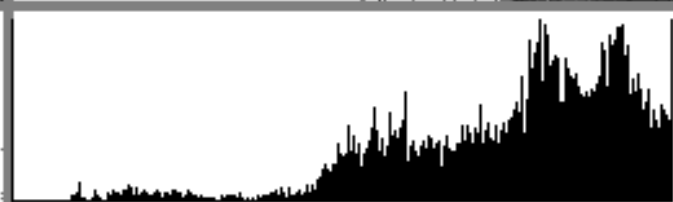
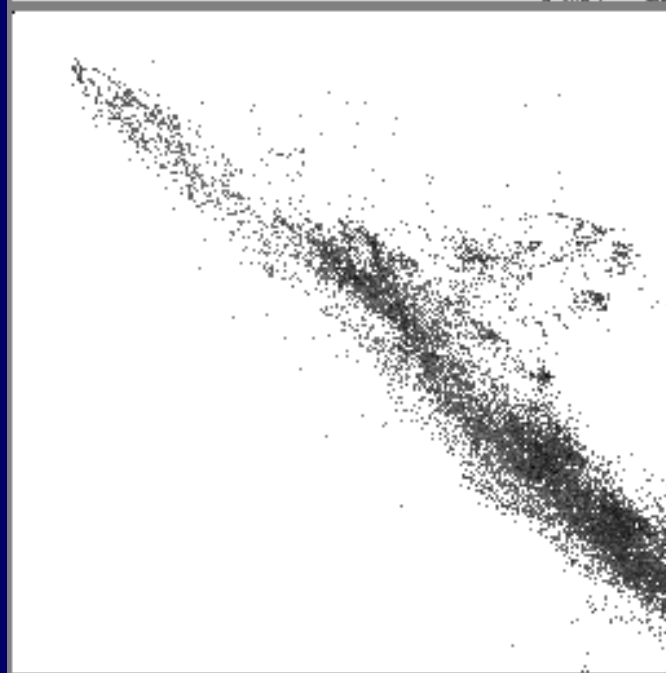
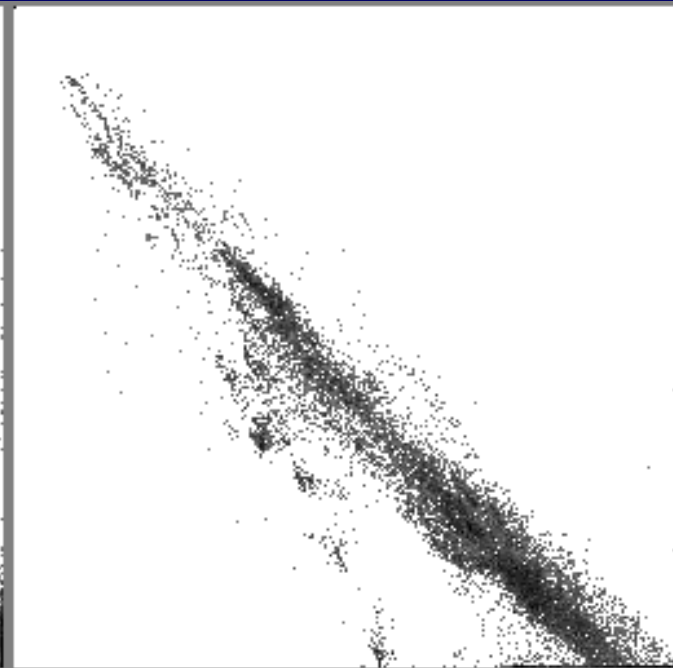
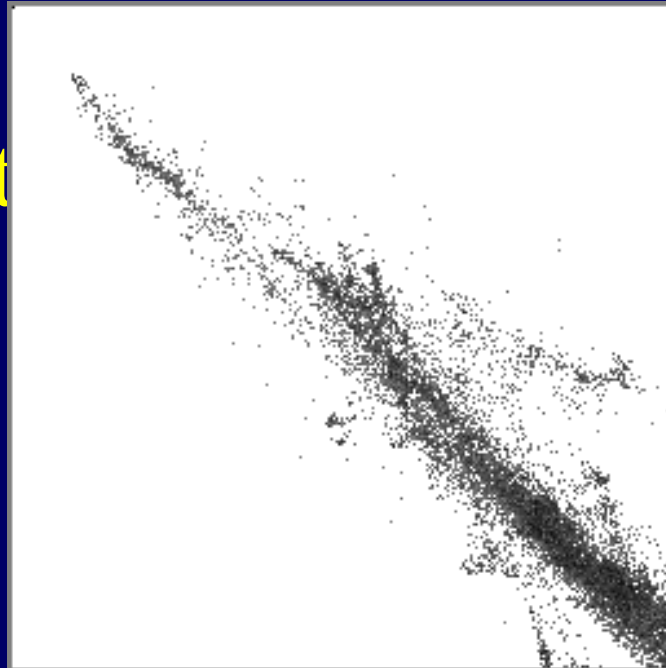
Séparation de
l'image en régions



Regroupement des plus gros segments

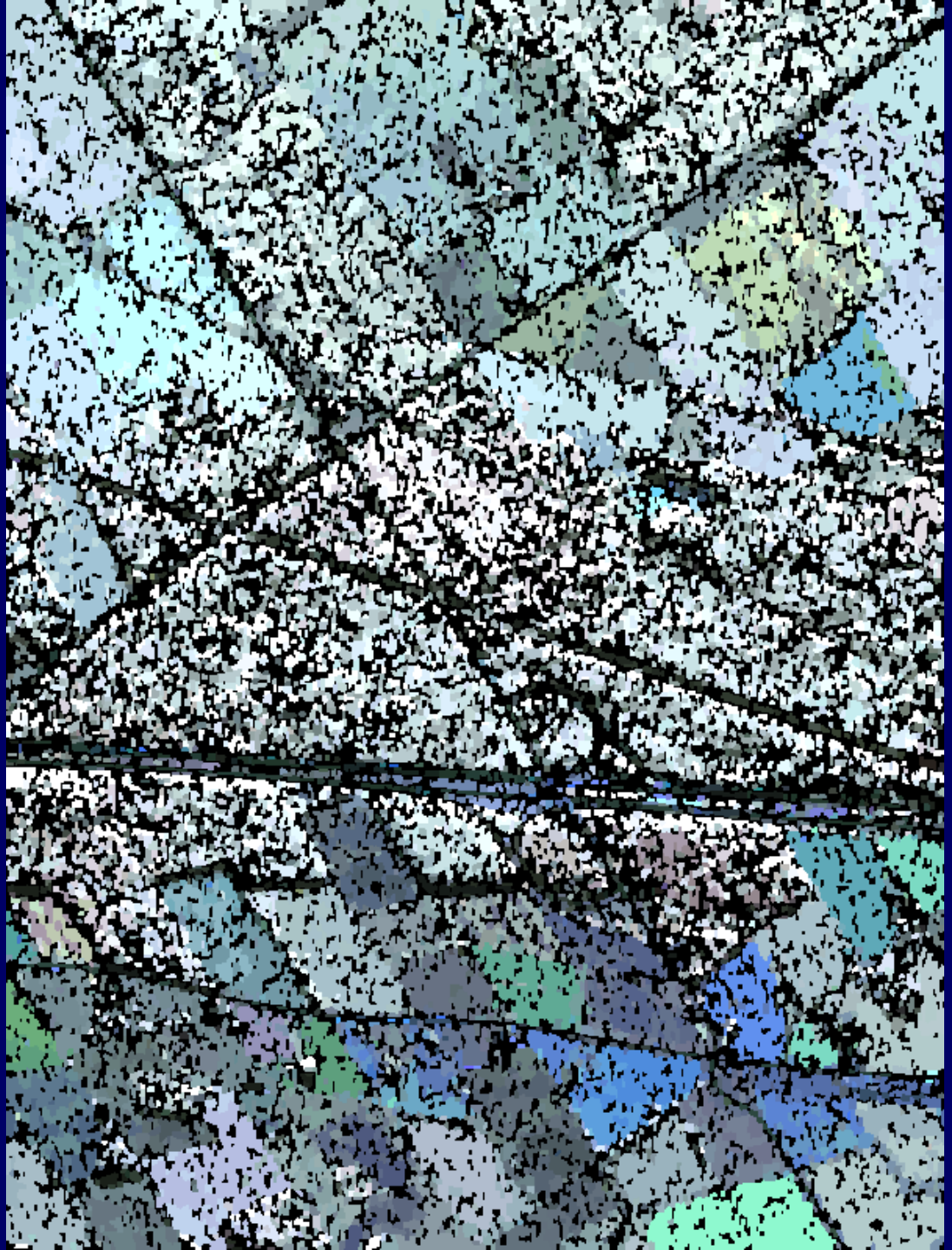


Regroupement
des plus gros
segments
après le
Mean-Shift



Regroupement
hiérarchique
des plus gros
segments après
Mean-Shift
200 groupes

11,897 régions



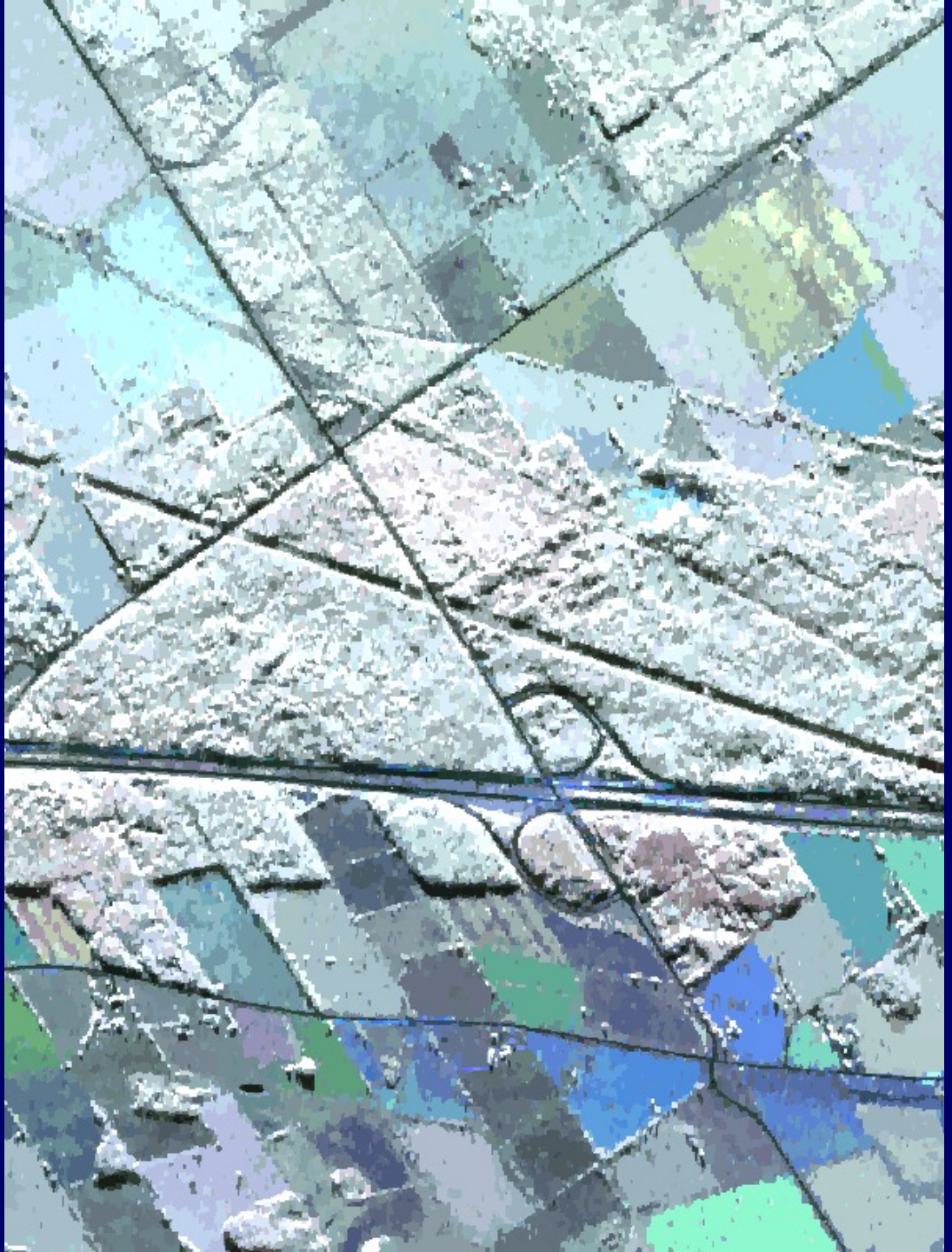
Regroupement
hiérarchique
des plus gros
segments après
Mean-Shift
200 groupes

11,897 régions



Assignment des
petits segments à
la région voisine
la plus similaire
avec Mean-Shift

28,882 régions

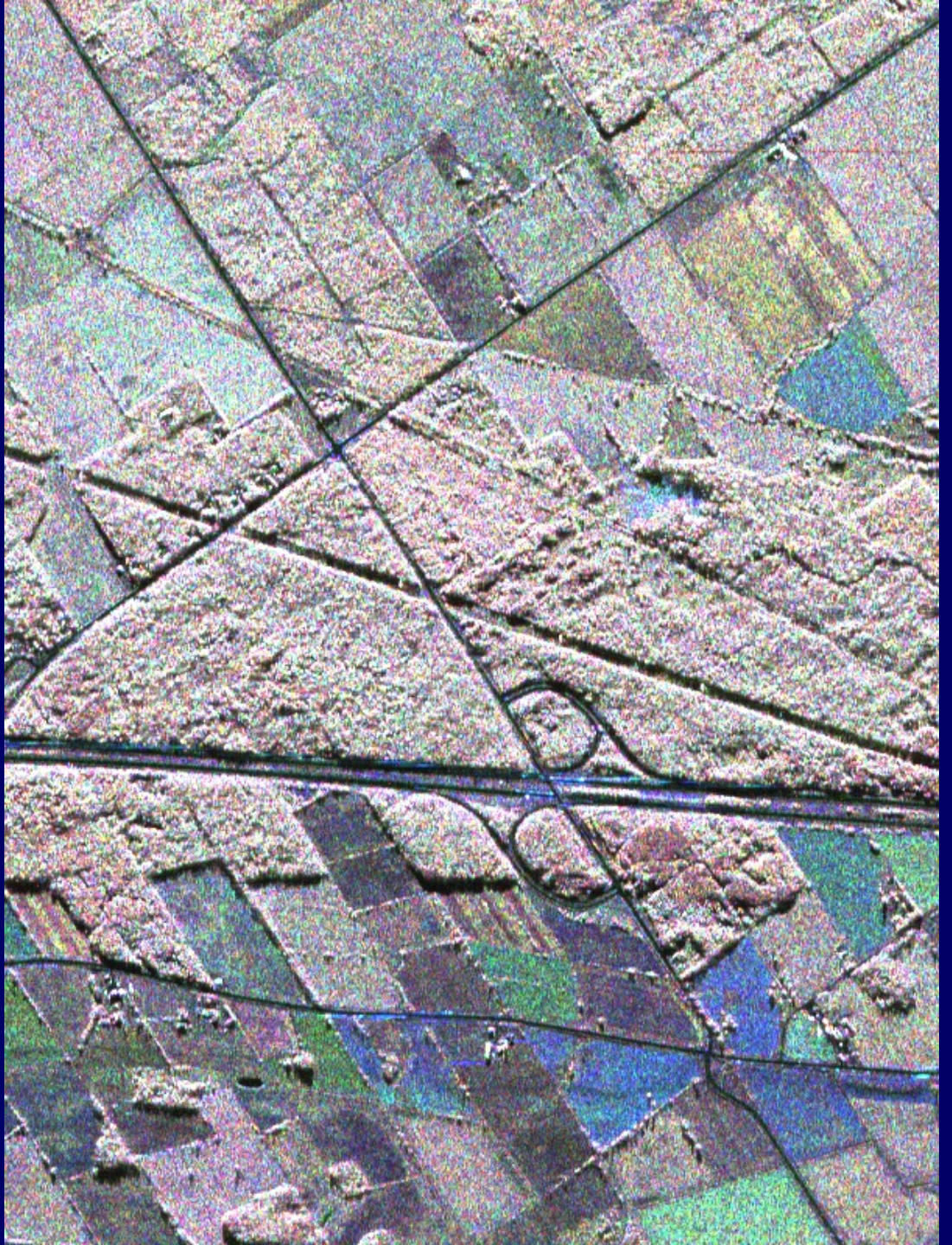


Assignment des
petits segments à
la région voisine
la plus similaire
avec Mean-Shift

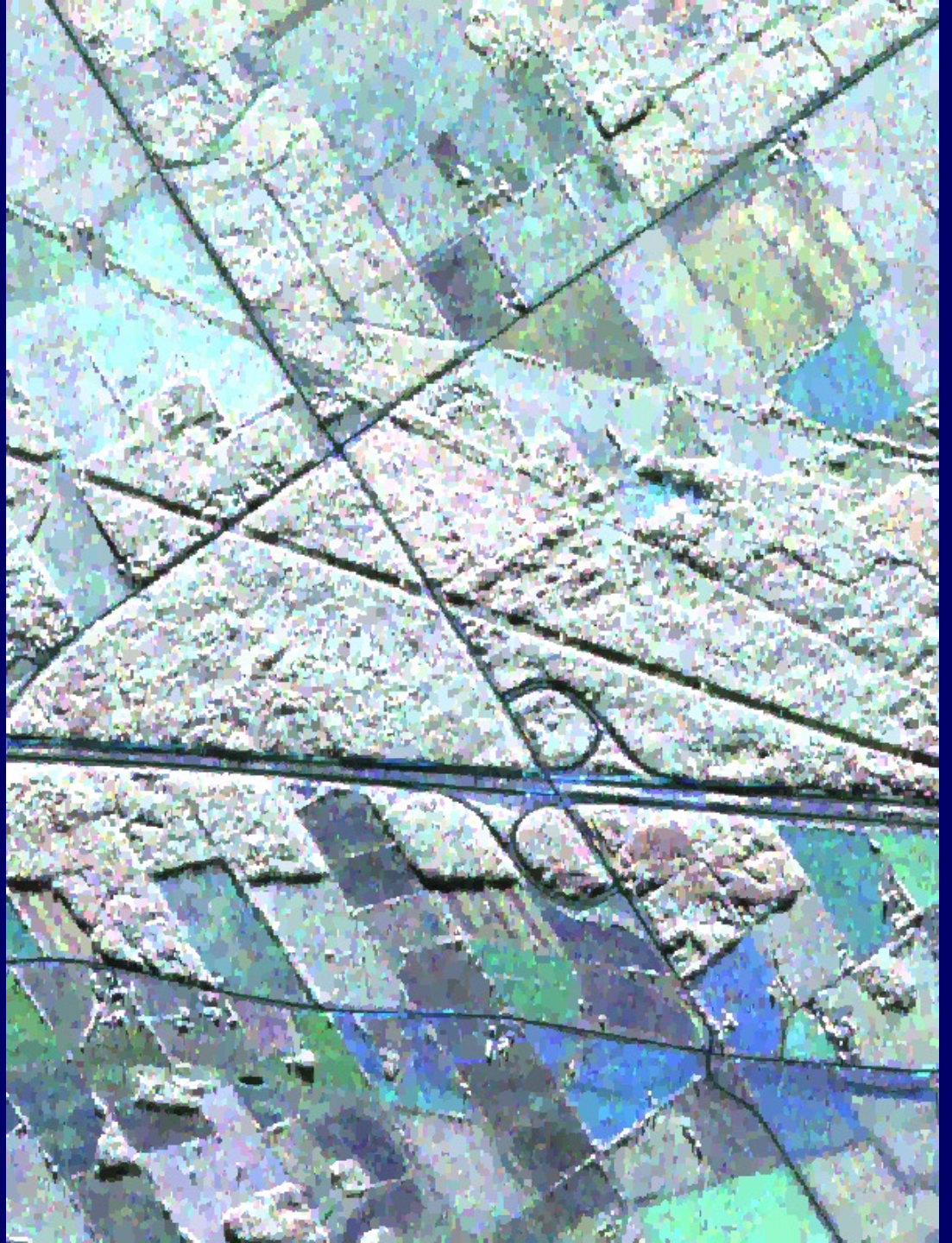
28,882 régions



Image PolSAR
600x800
9 vues
Région de
Mer Bleu (Ottawa)



Approximation
par 48,000
segments



Résultat du
regroupement
(Mean-Shift +
hiérarchique)

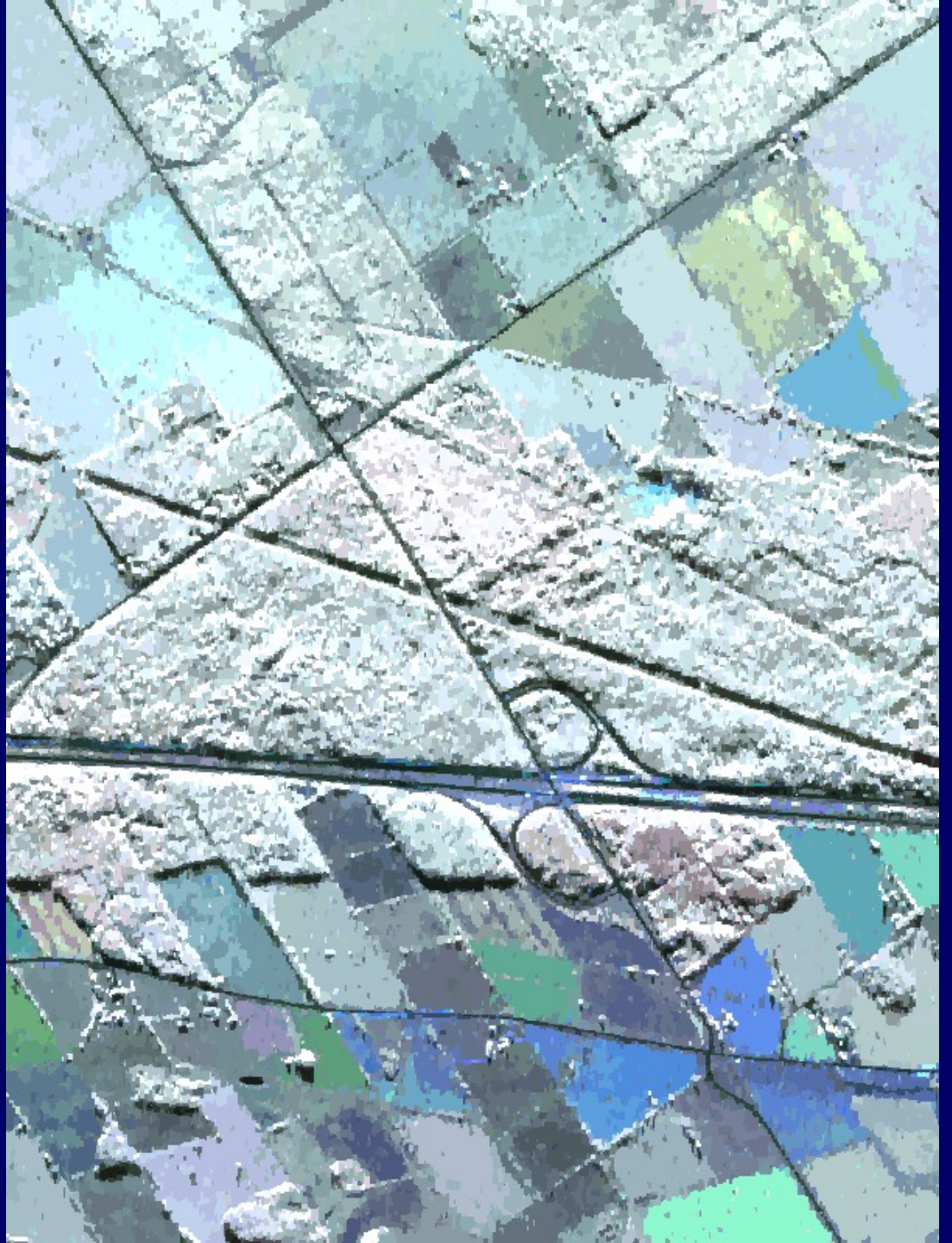
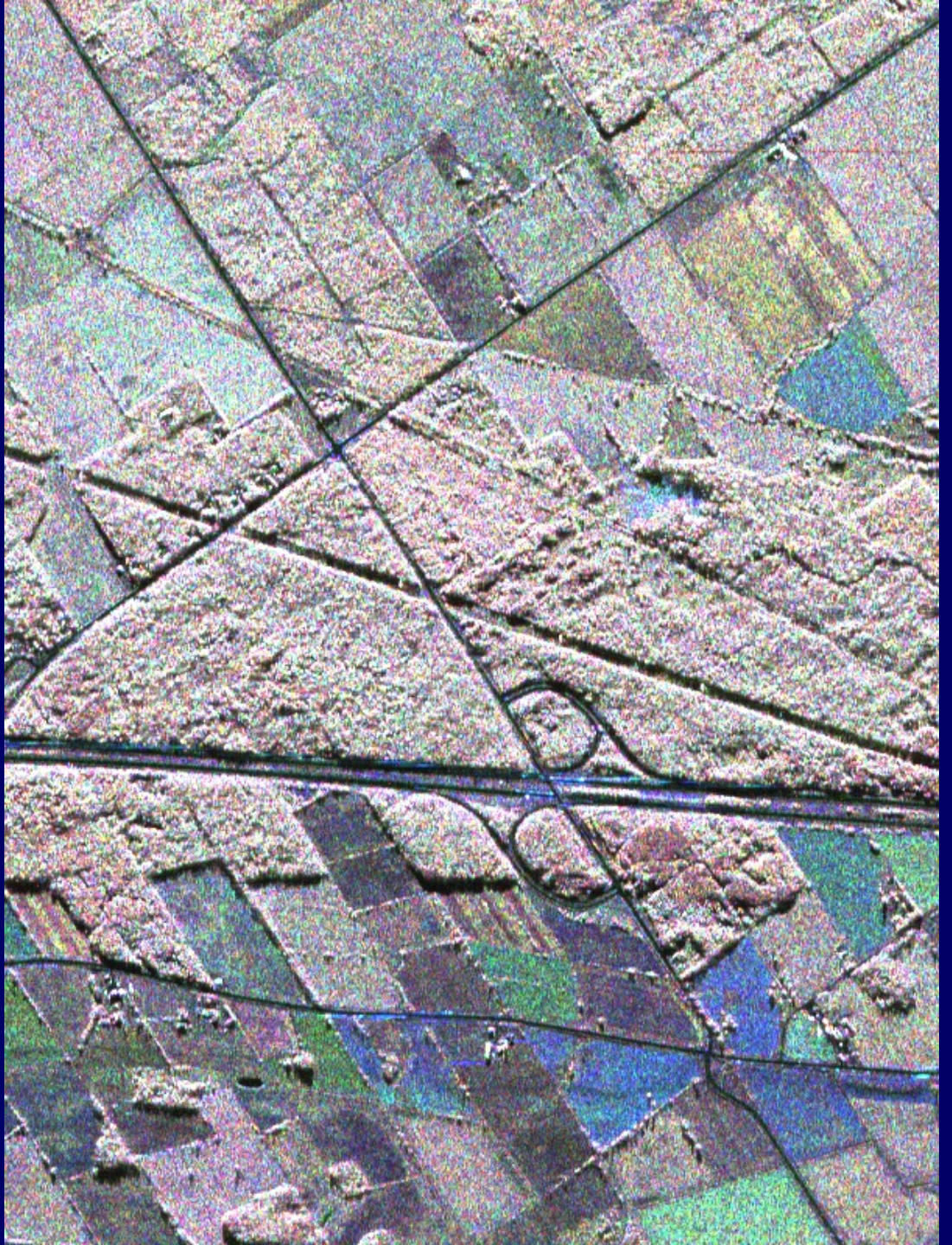


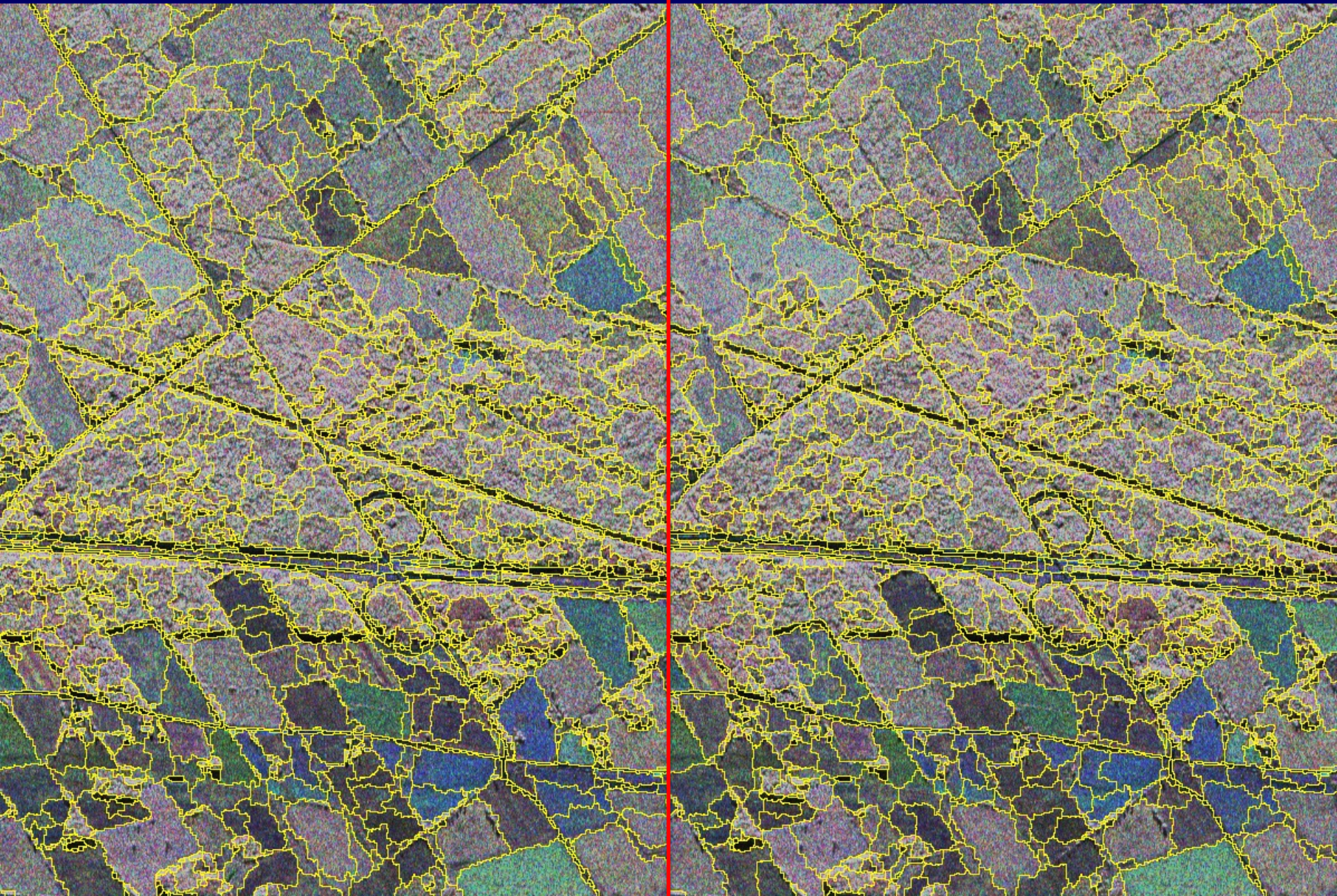
Image PolSAR
600x800
9 vues
Région de
Mer Bleu (Ottawa)



Combiné

2000 régions

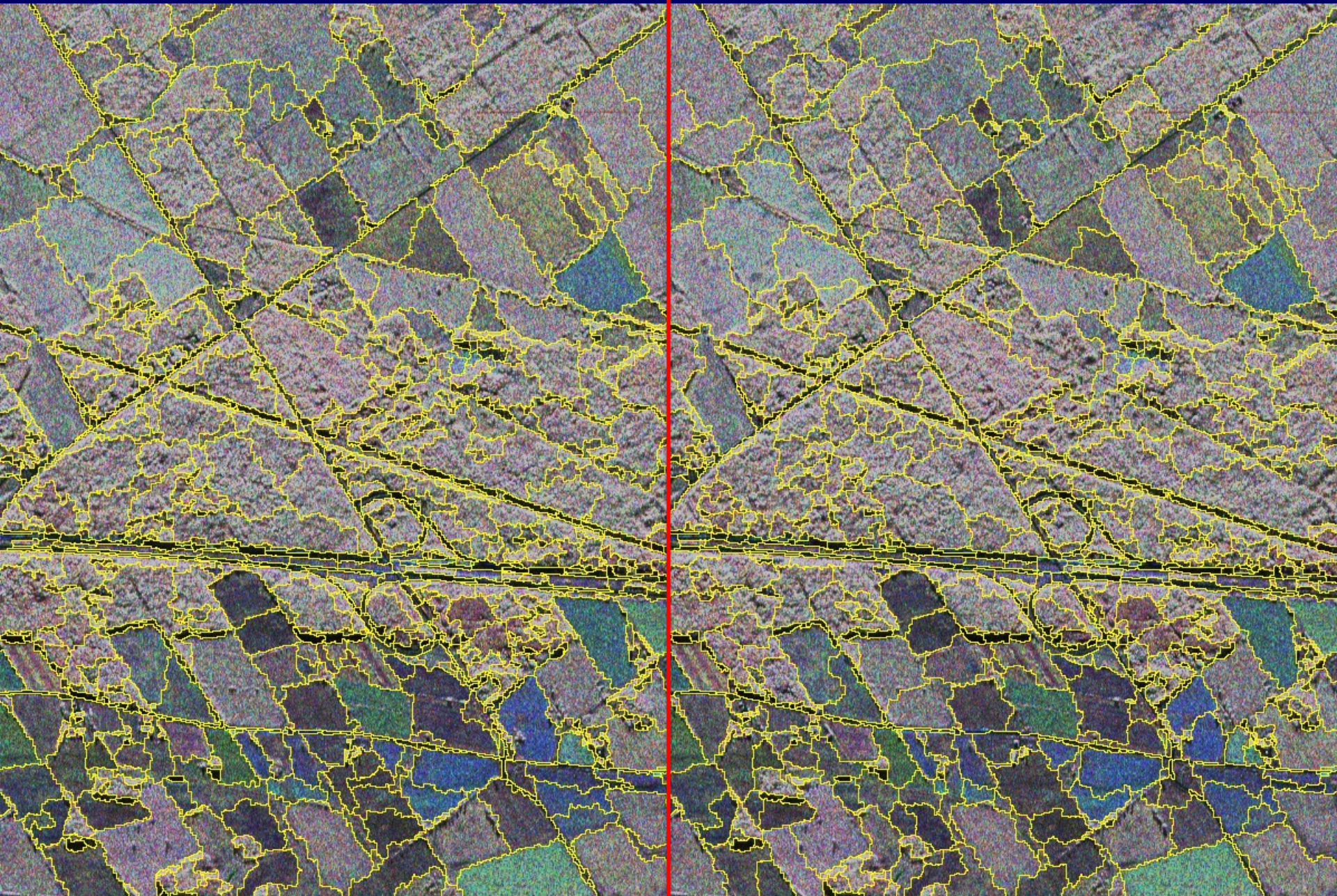
Initial



Combiné

1000 régions

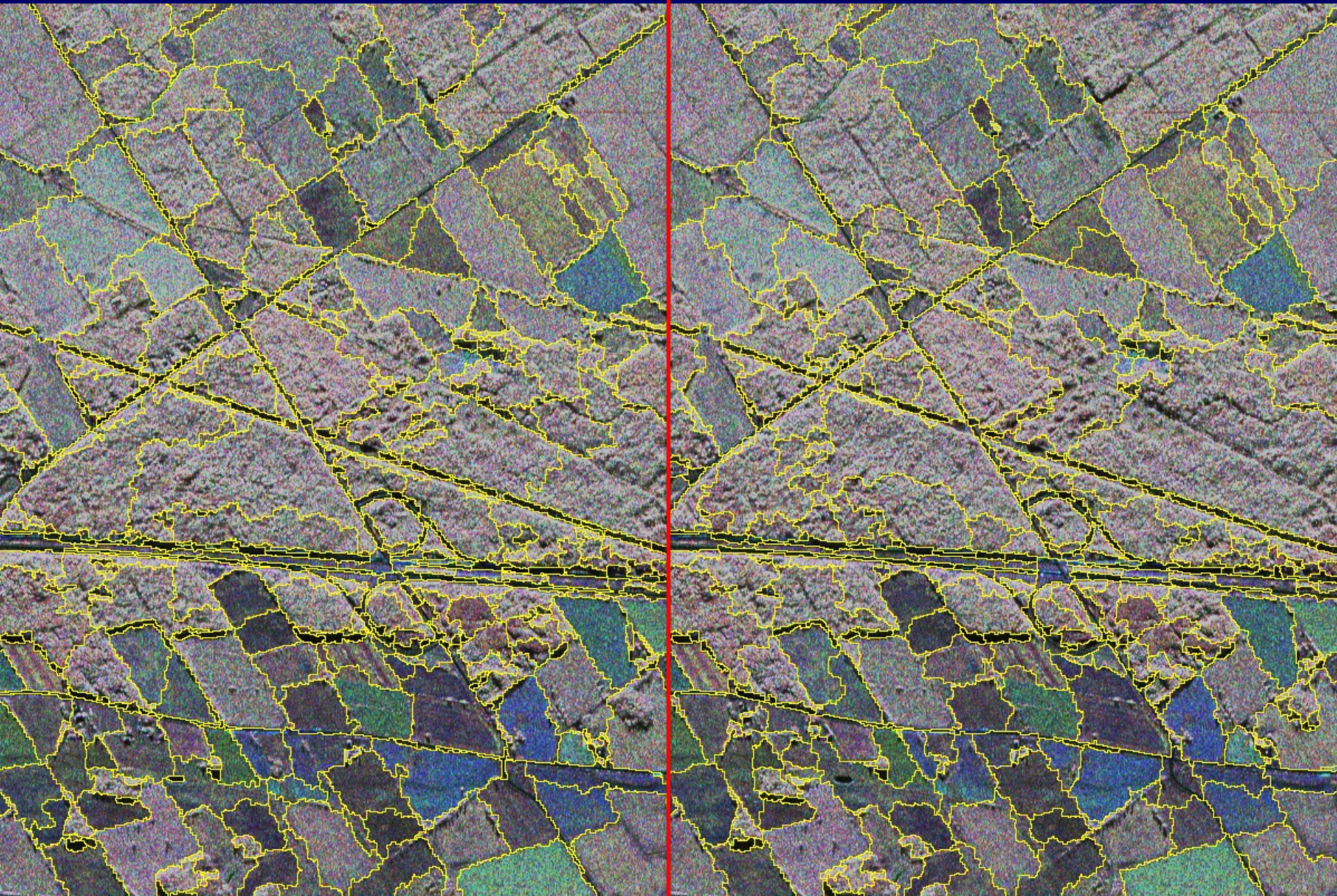
Initial



Combiné

500 régions

Initial



CONCLUSION

- Difficulté de la segmentation et du regroupement
- Avantage de combiner segmentation et regroupement
- Avantage de combiner itératif et hiérarchique