Automatic Detection and Classification of Sunspot Images

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Joint work with Alex Young and the SaFeDe Solar Imaging Group

Outline

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2. Classification (in progress)
    - spatial complexity measure
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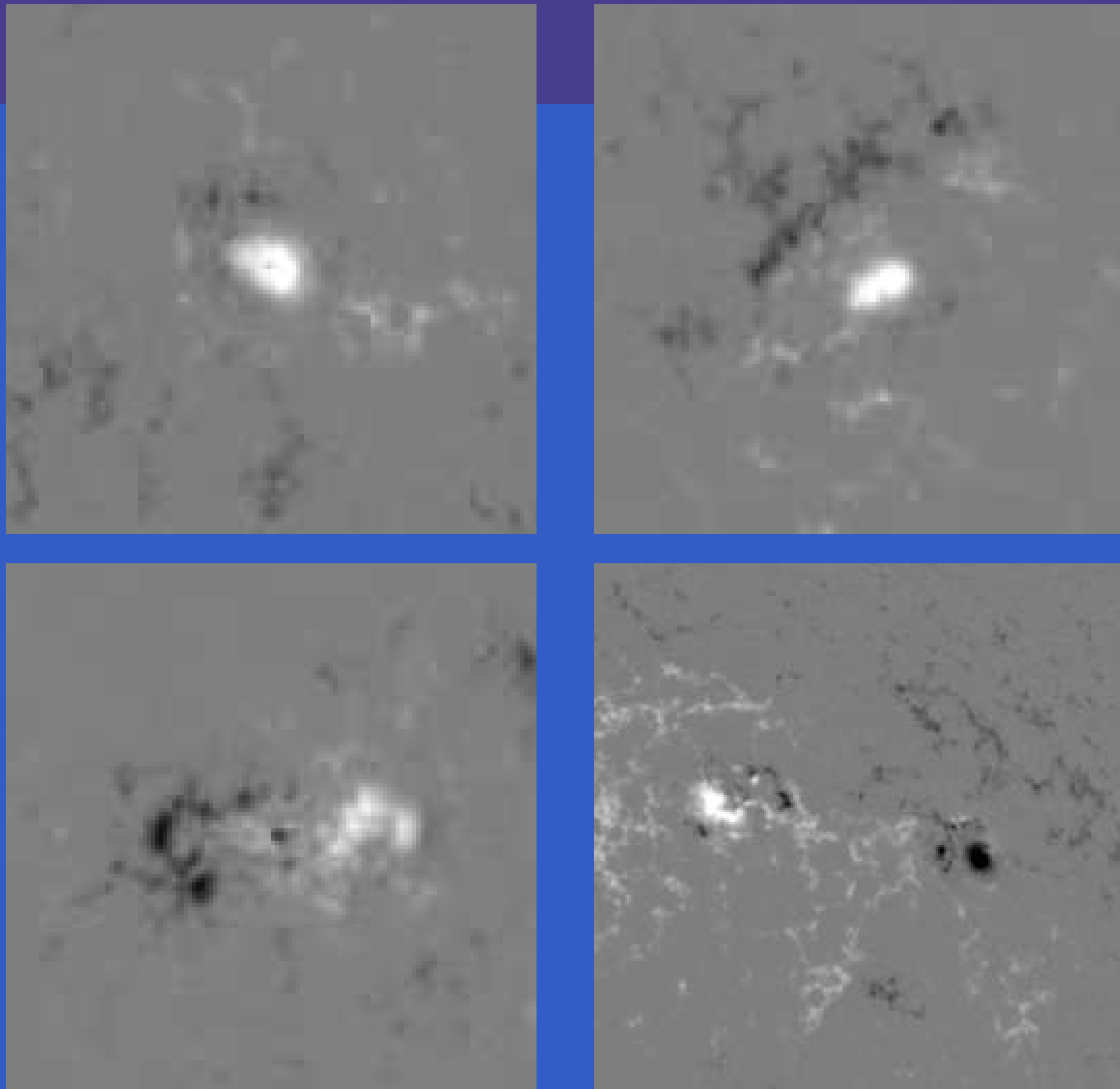

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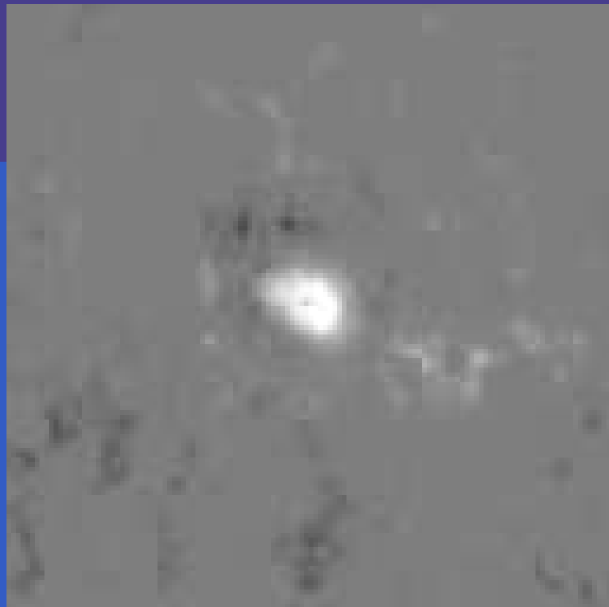
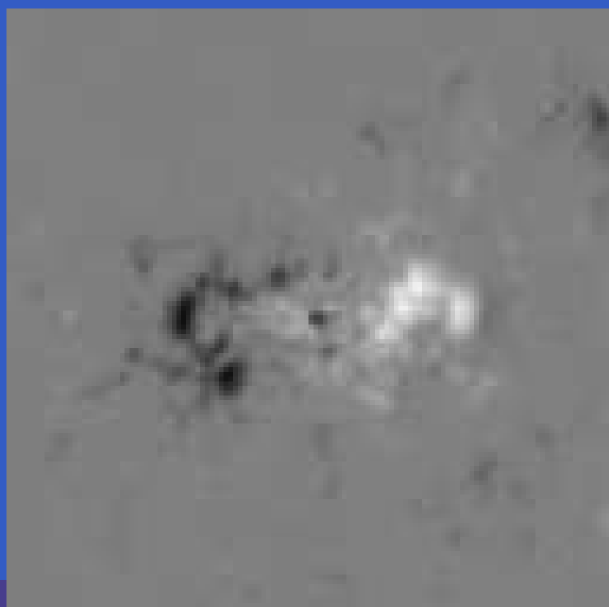
α



β

$\beta\gamma$



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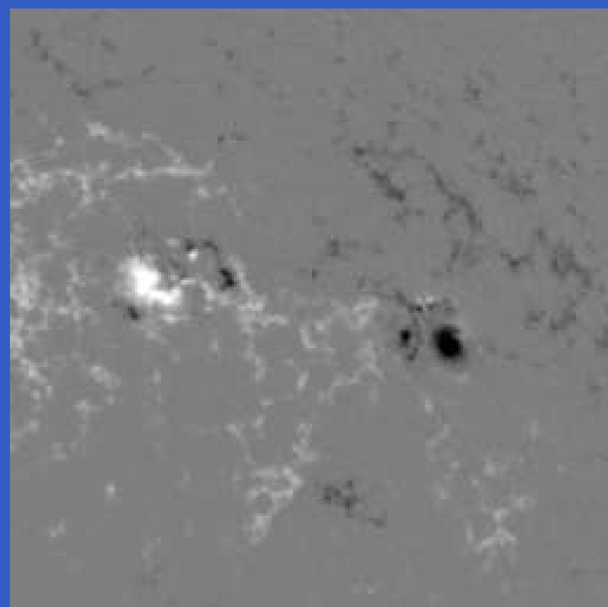

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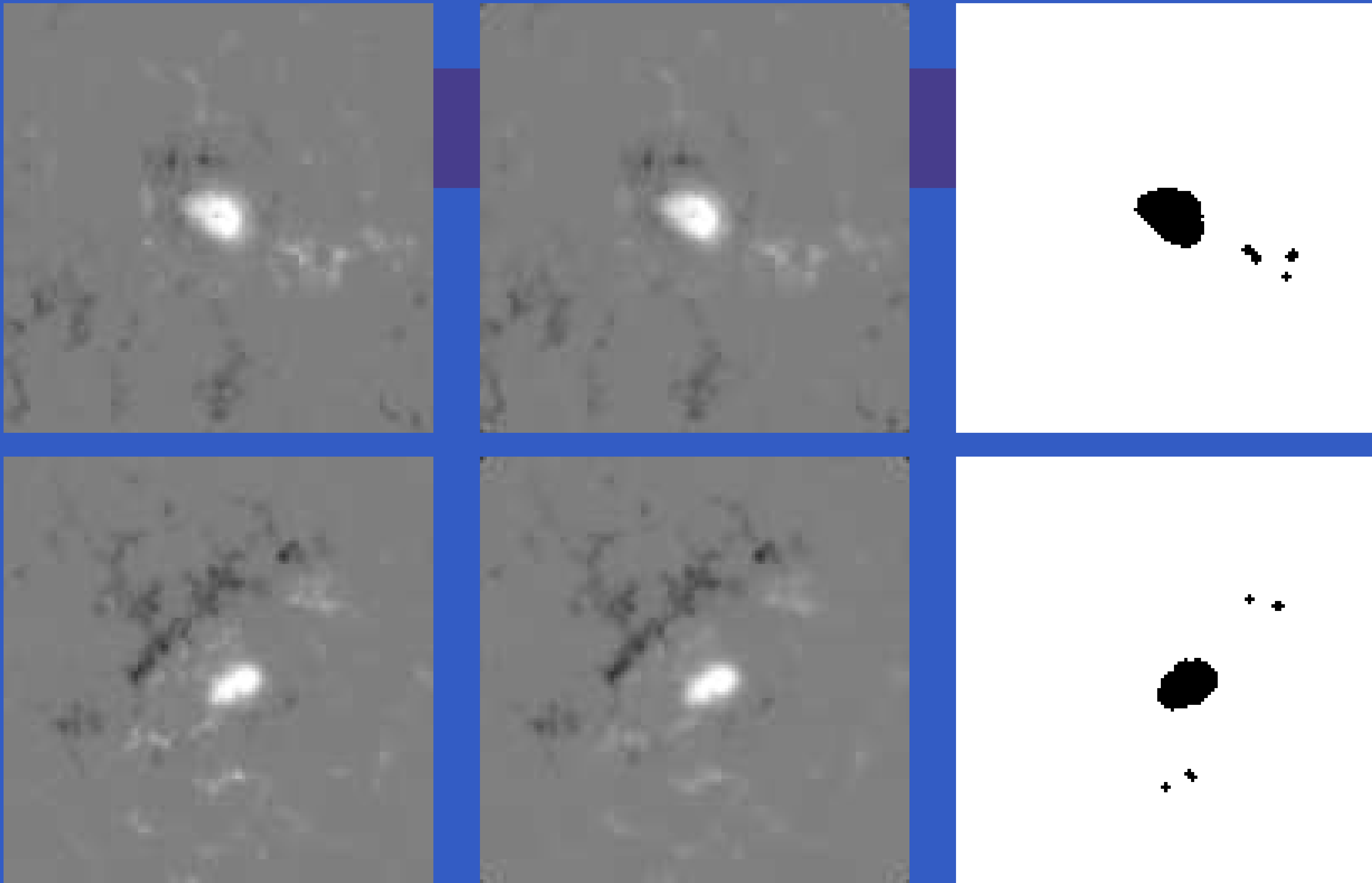
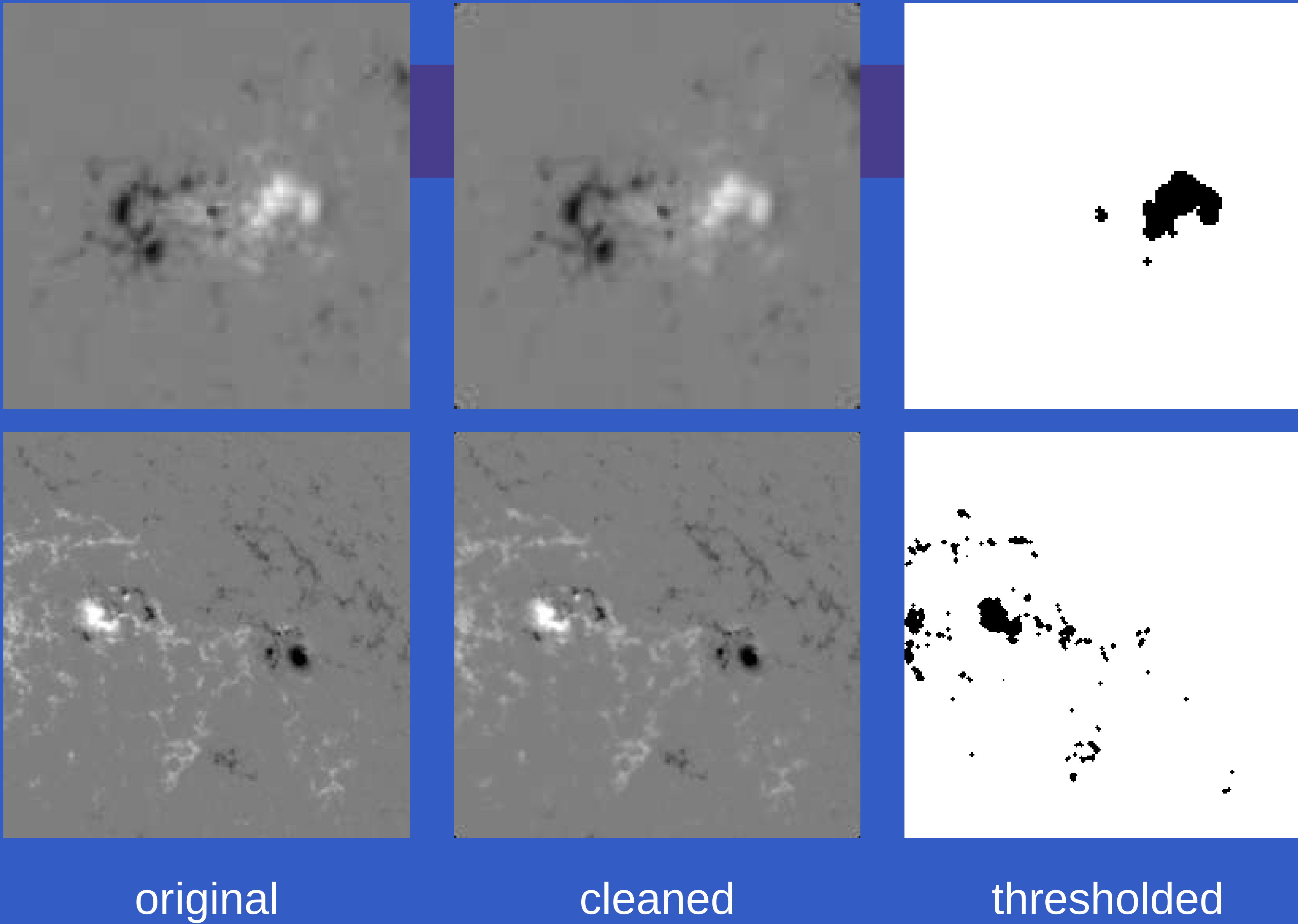
  1. cleaning: use a morphological opening operation (minimum filtering followed by a maximum filtering)
  2. thresholding: keep pixels that have greyvalues larger than "$\bar{x} + 2s$"
- black sunspots: apply the same steps to the negative of the image



original cleaned thresholded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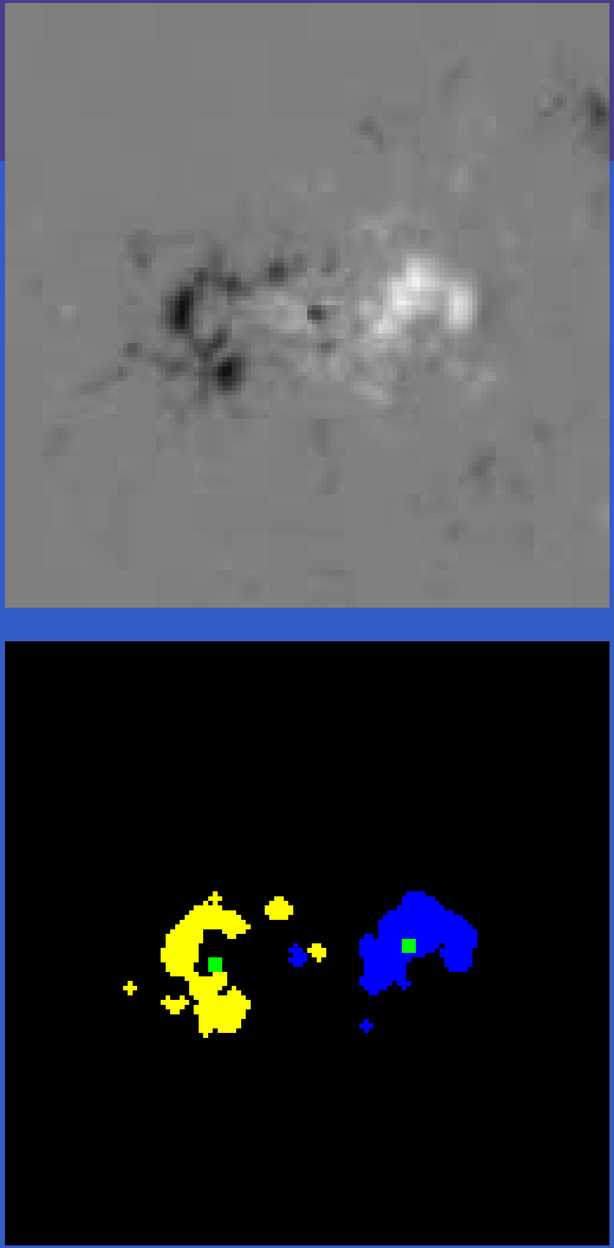
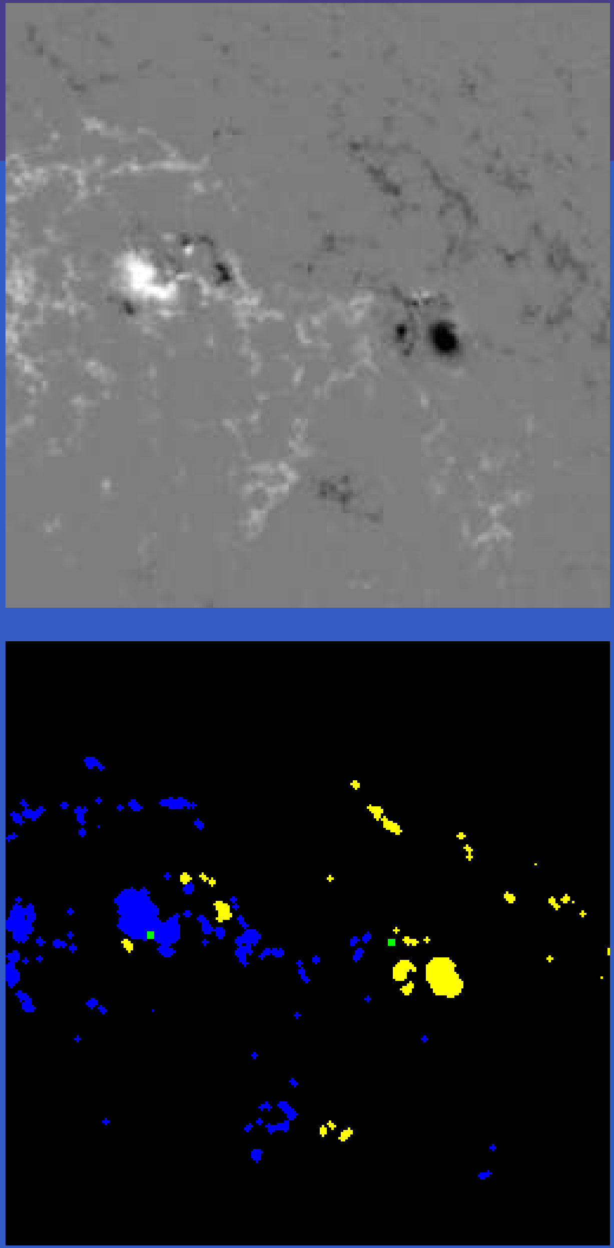
- we propose a new measure for feature 3

$\beta\gamma$ $\beta\gamma\delta$





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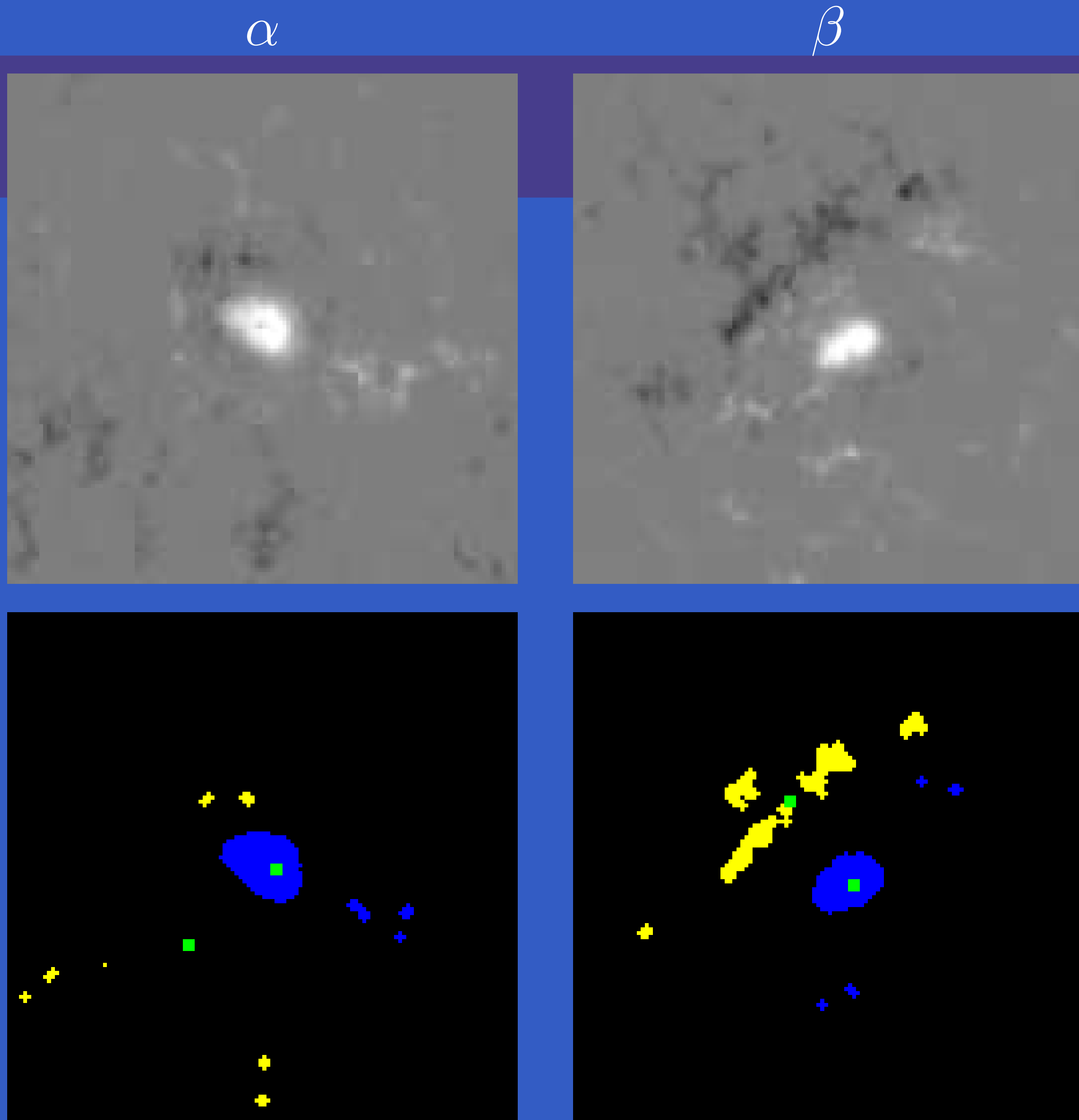
- similarly for black pixels: $A(B)$

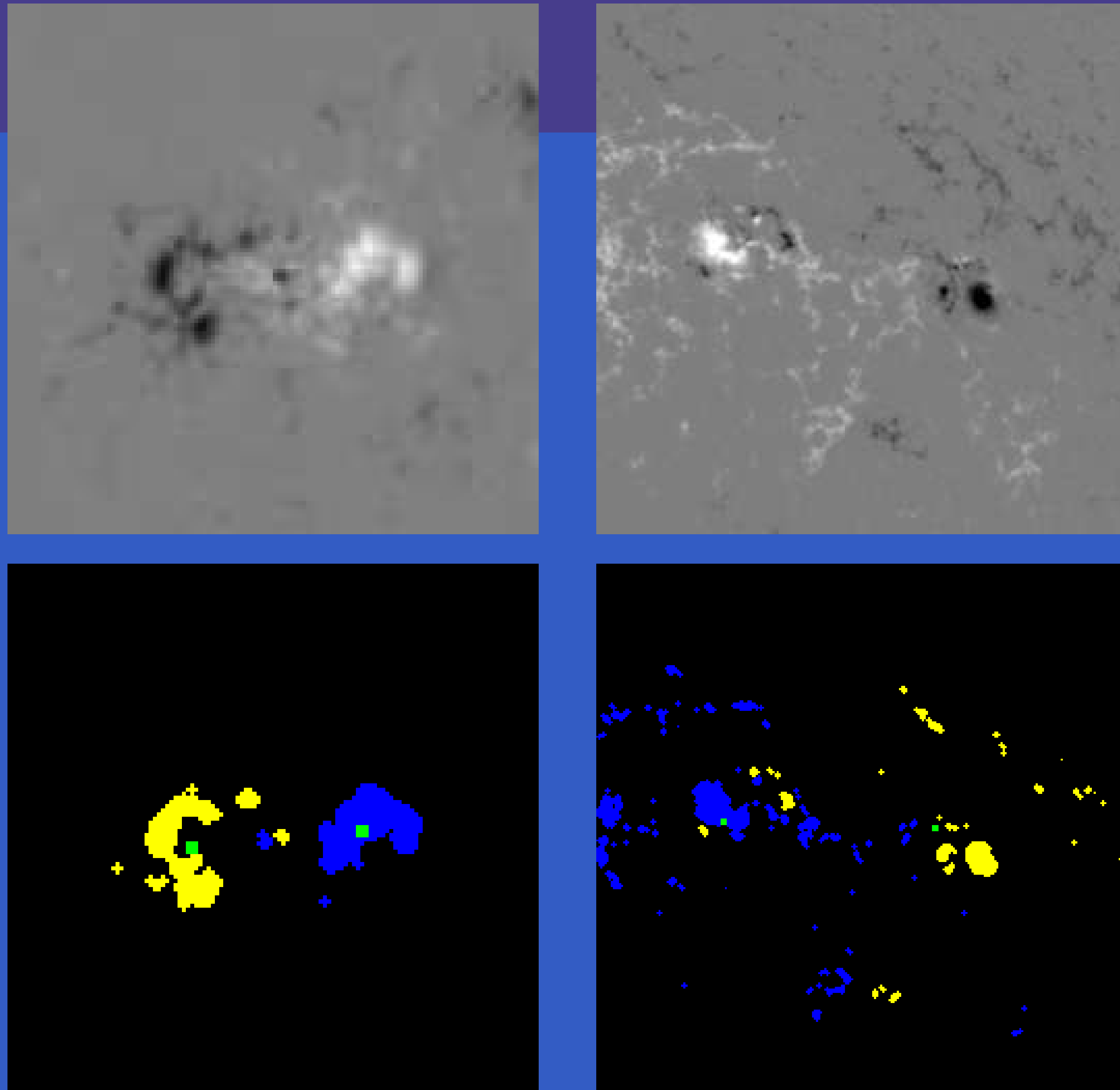
$$\left(\frac{|W|}{|B|},\, A(W),\, A(B)\right)$$



(6.13, 0.07, 0.95) (0.78, 0.08, 0.48)

$\beta\gamma$ $\beta\gamma\delta$

$$\left(\frac{|W|}{|B|}, A(W), A(B)\right)$$



(1.10, 0.04, 0.53) (2.50, 0.92, 0.52)

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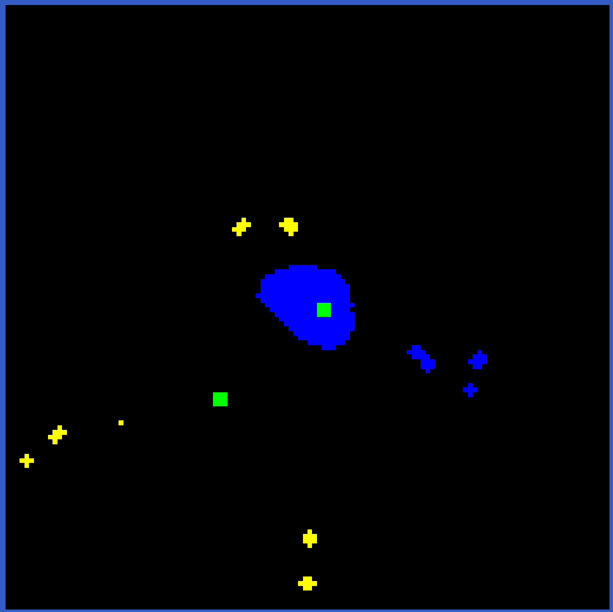

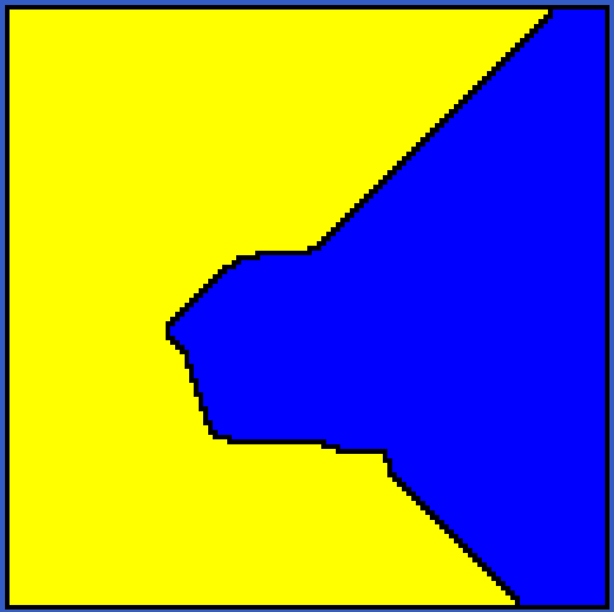

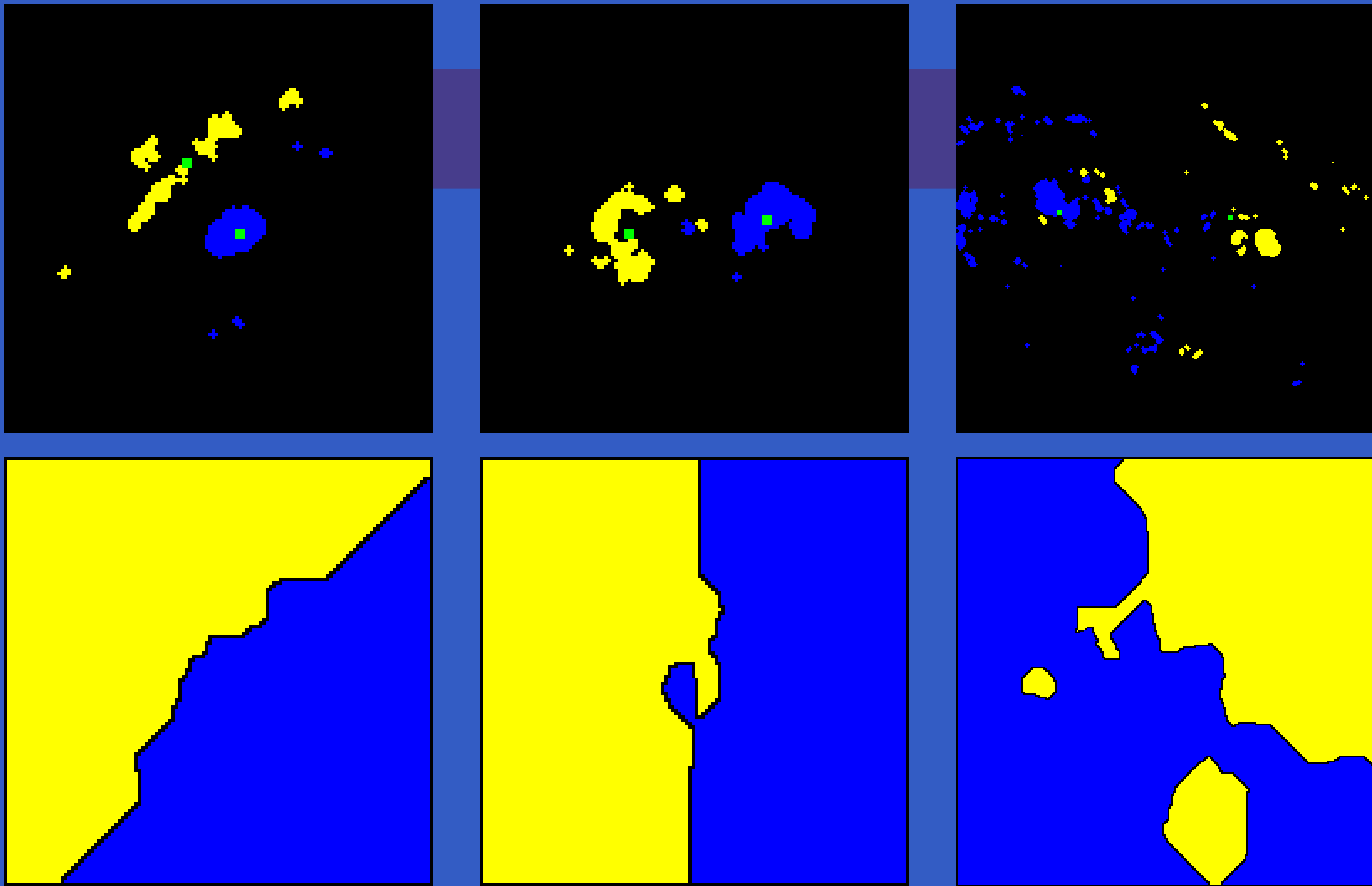

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- still experimenting with different ideas...

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  - need methods for target tracking

Thank You!