



NCAR



Forecast Verification Using Objects

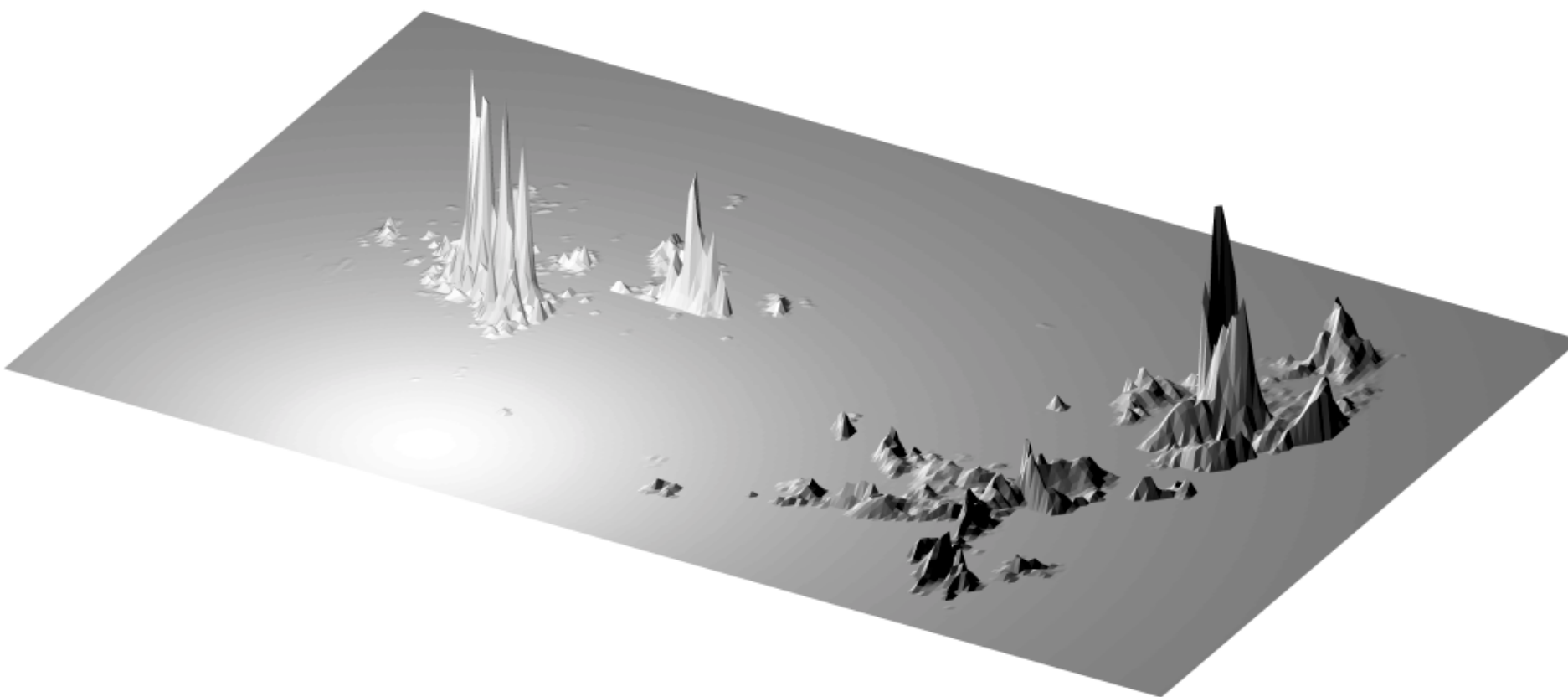
R. Bullock

National Center for Atmospheric Research

OUTLINE

- *Review of Object Detection*
 - *Use of Fuzzy Logic in
Merging and Matching*
 - *A Simple Application*
 - *Future Directions*
-

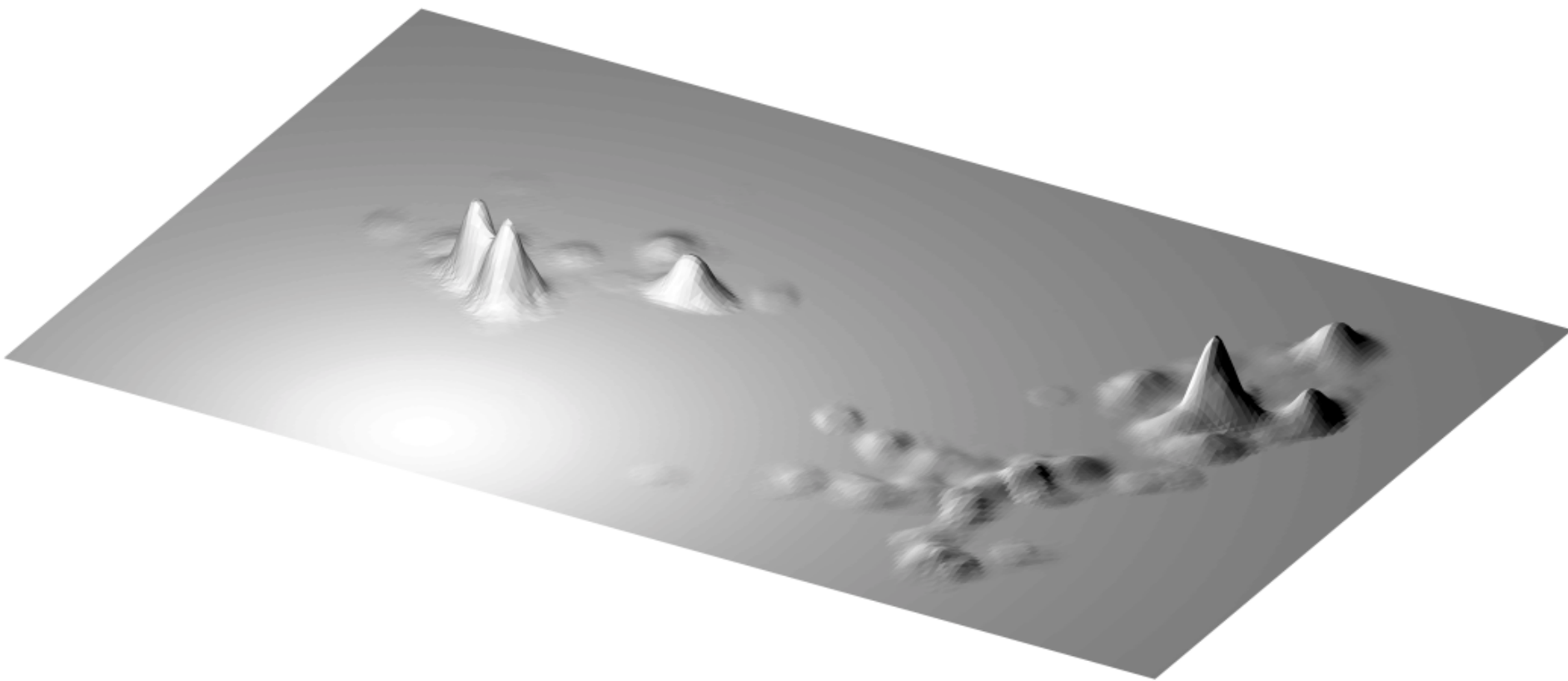
*Also see talks later in this Conference by
Barb Brown and Eric Gilleland*



Valid: July 5, 2001 06:00:00 UT

Lead: 6 hours

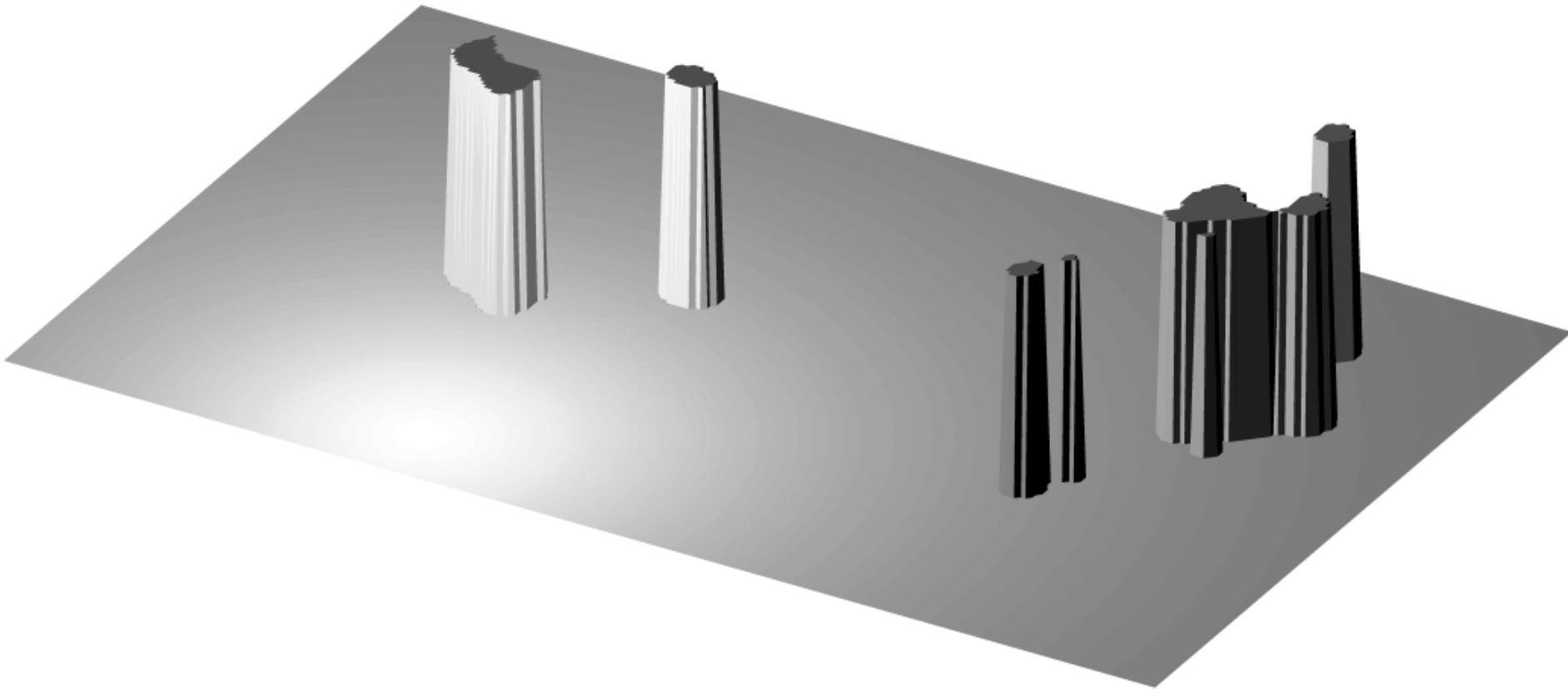
Field: raw



Valid: July 5, 2001 06:00:00 UT

Lead: 6 hours

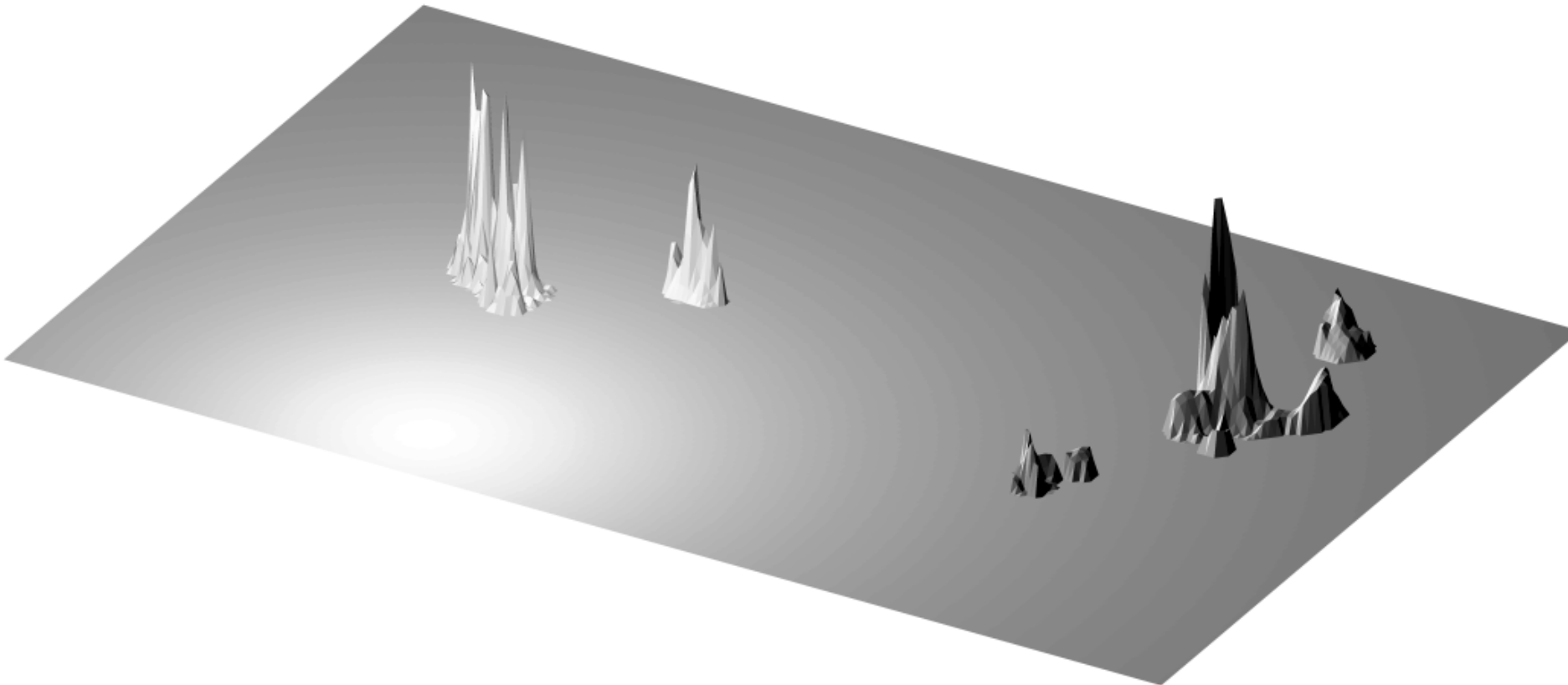
Field: conv



Valid: July 5, 2001 06:00:00 UT

Lead: 6 hours

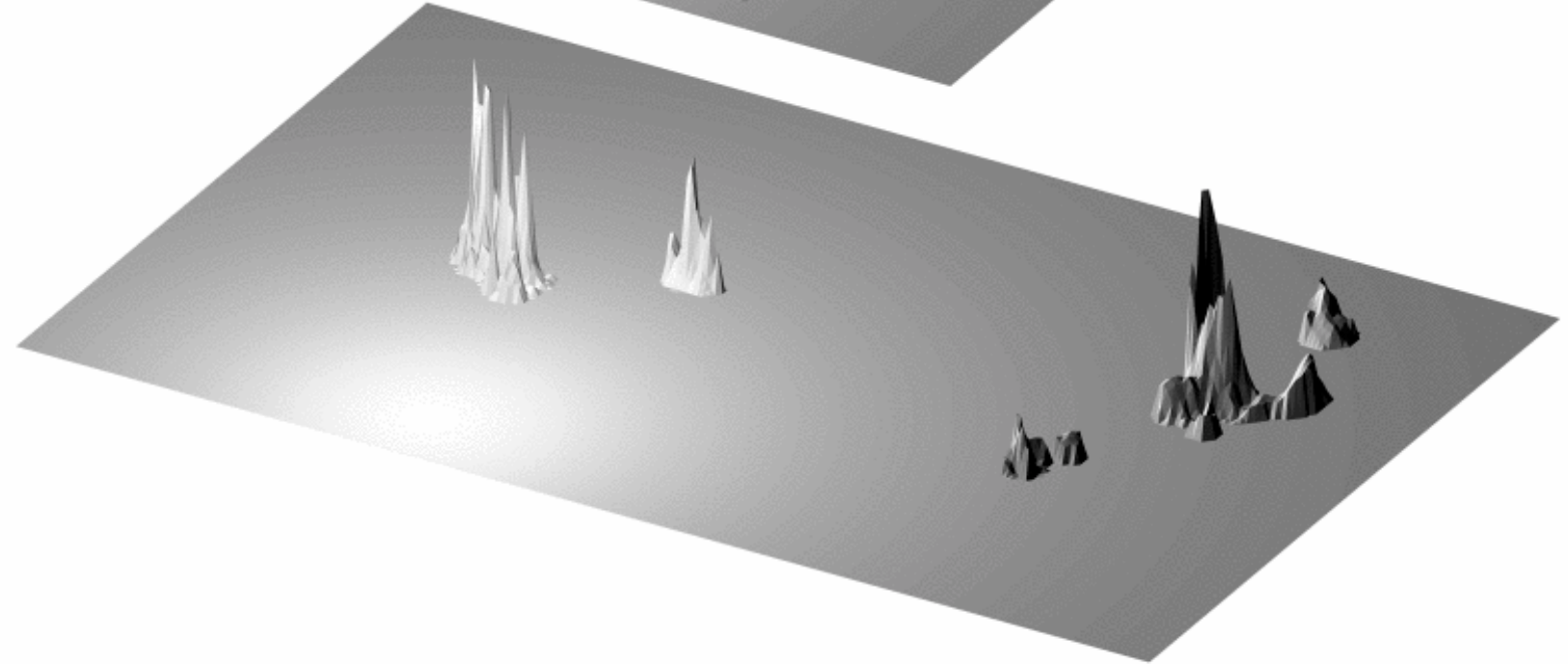
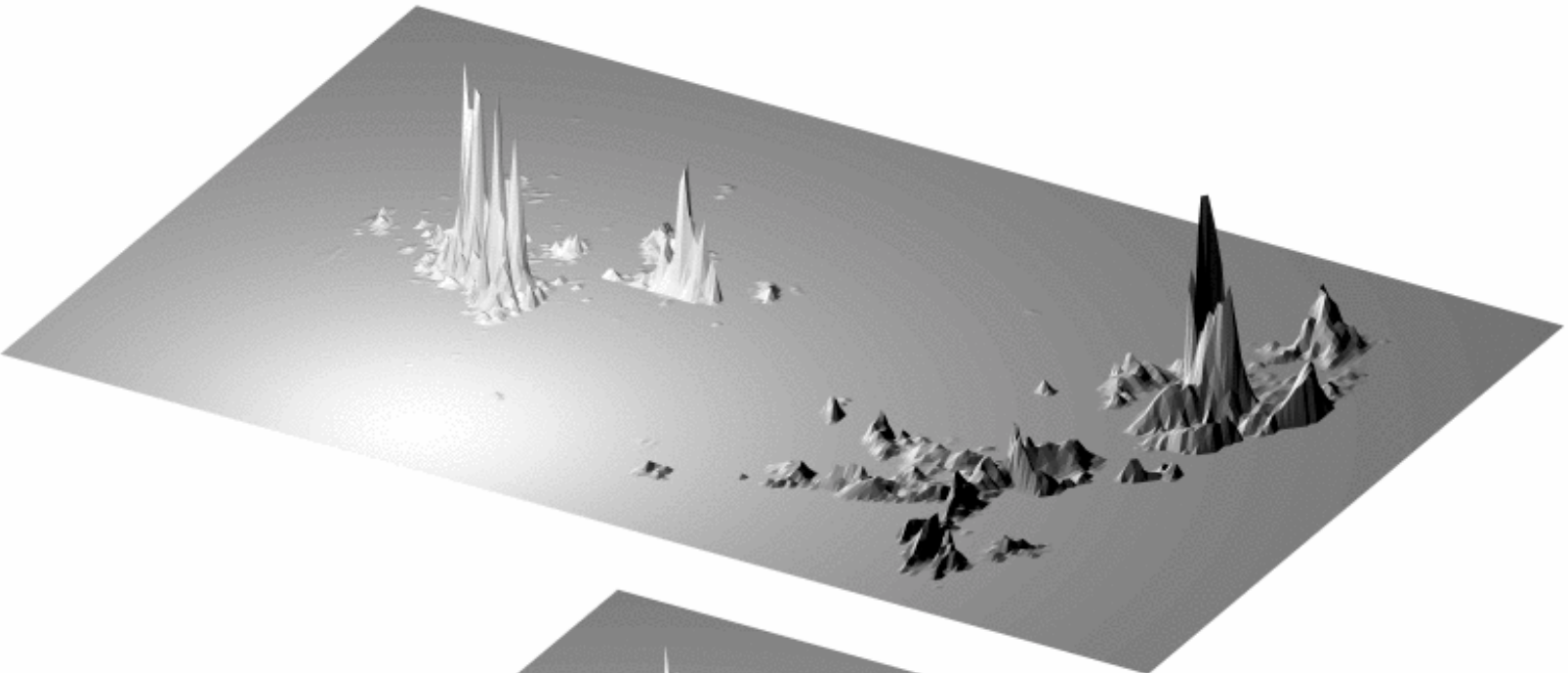
Field: mask



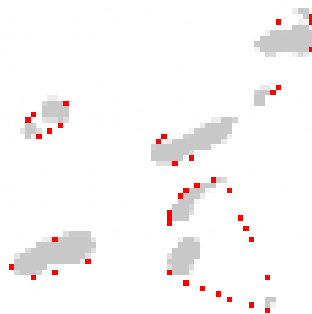
Valid: July 5, 2001 06:00:00 UT

Lead: 6 hours

Field: obj

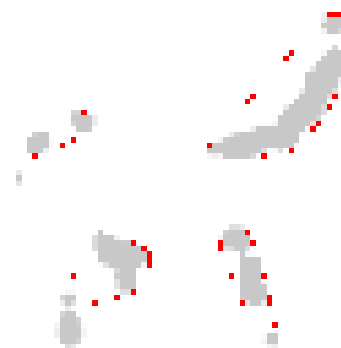


Valid Jul 2, 2004 14h



WRF

True! 2h



Stage 4

Fuzzy Logic

- *Attributes*

Object Attributes

Simple or Composite

Single

- *Area*
- *Centroid*
- *Axis Angle*
- *Angle Confidence*
- *Median Intensity*

Pair

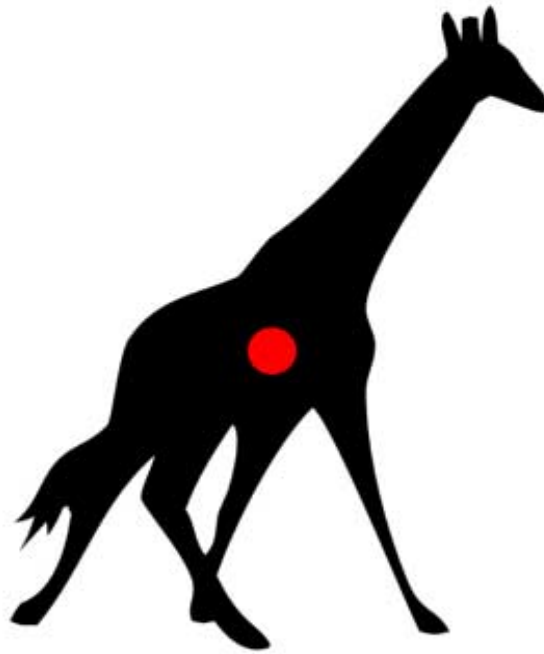
- *Intersection*
- *Union*
- *Centroid Distance*
- *Angle Difference*
- *Area Ratio*
- *Intensity Ratio*

Object Attributes

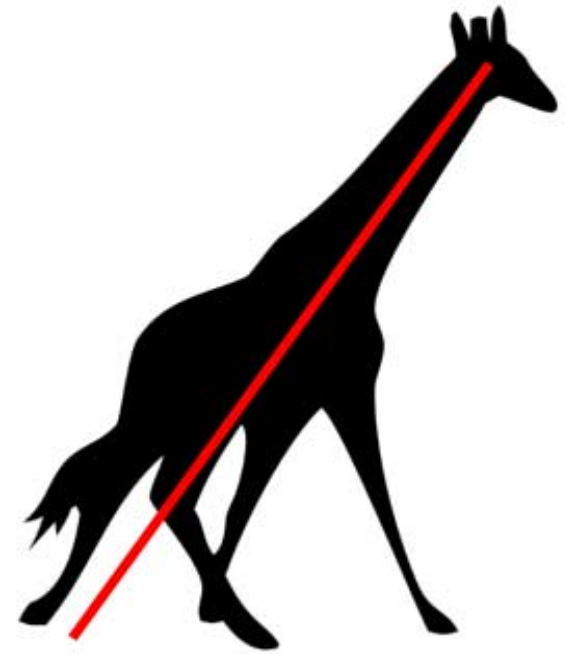
Centroid and Axis



Object

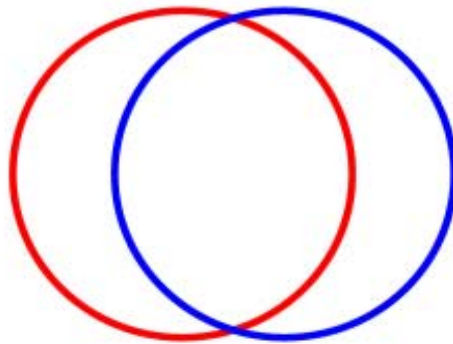


Centroid

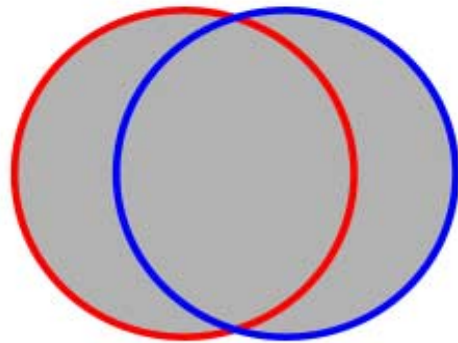


Axis

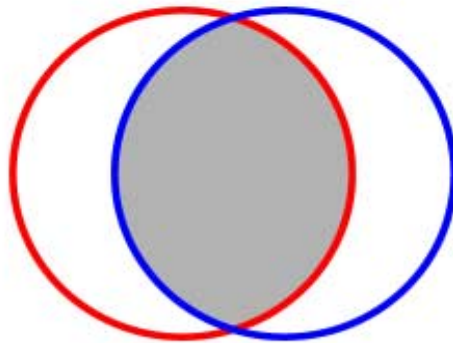
*Forecast
Object*



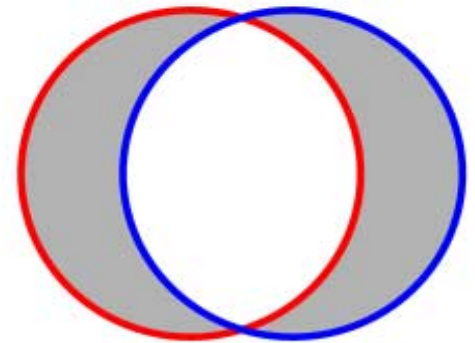
*Observed
Object*



Union



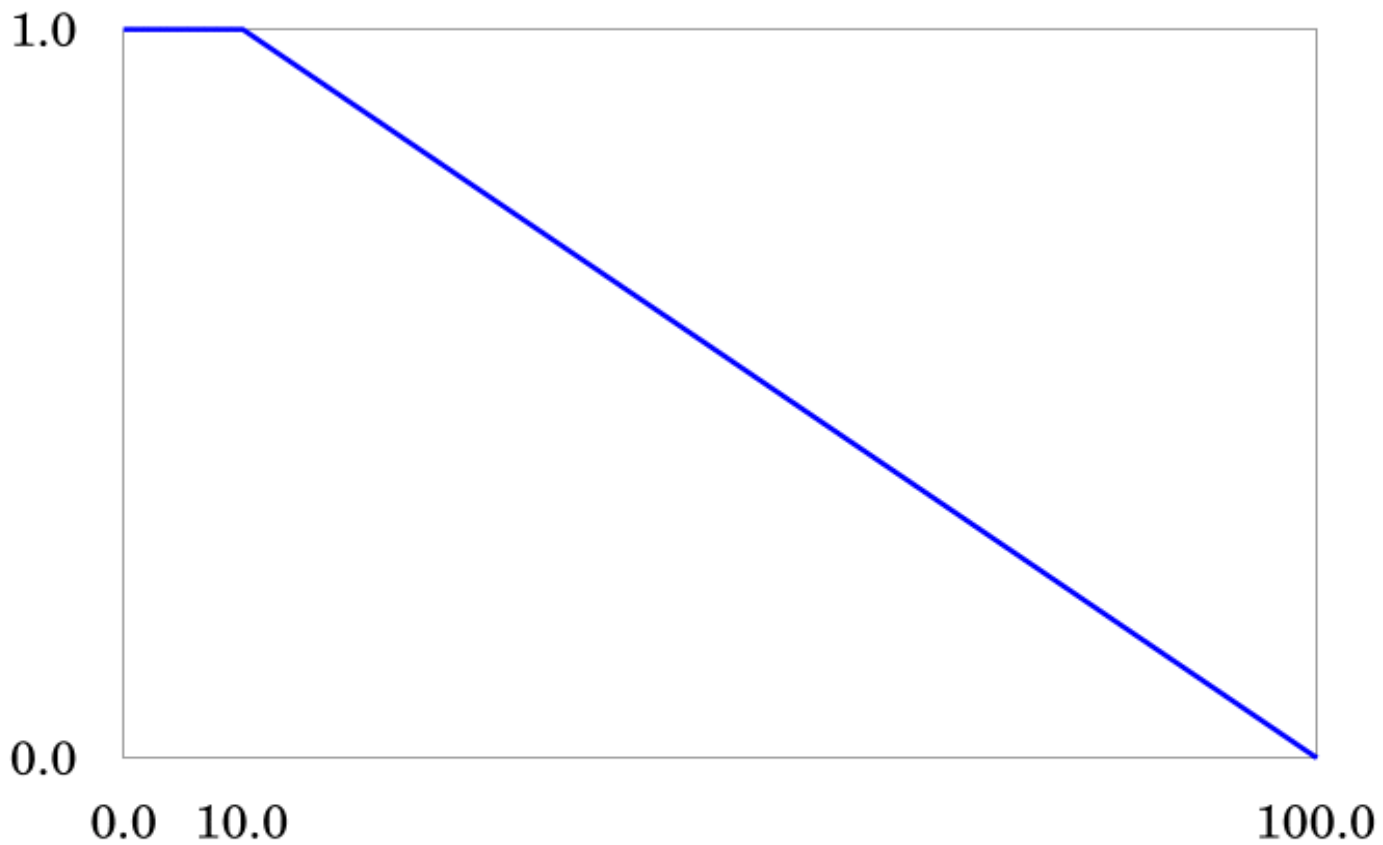
Intersection



*Symmetric
Difference*

Fuzzy Logic

- *Attributes*
- *Interest Maps*

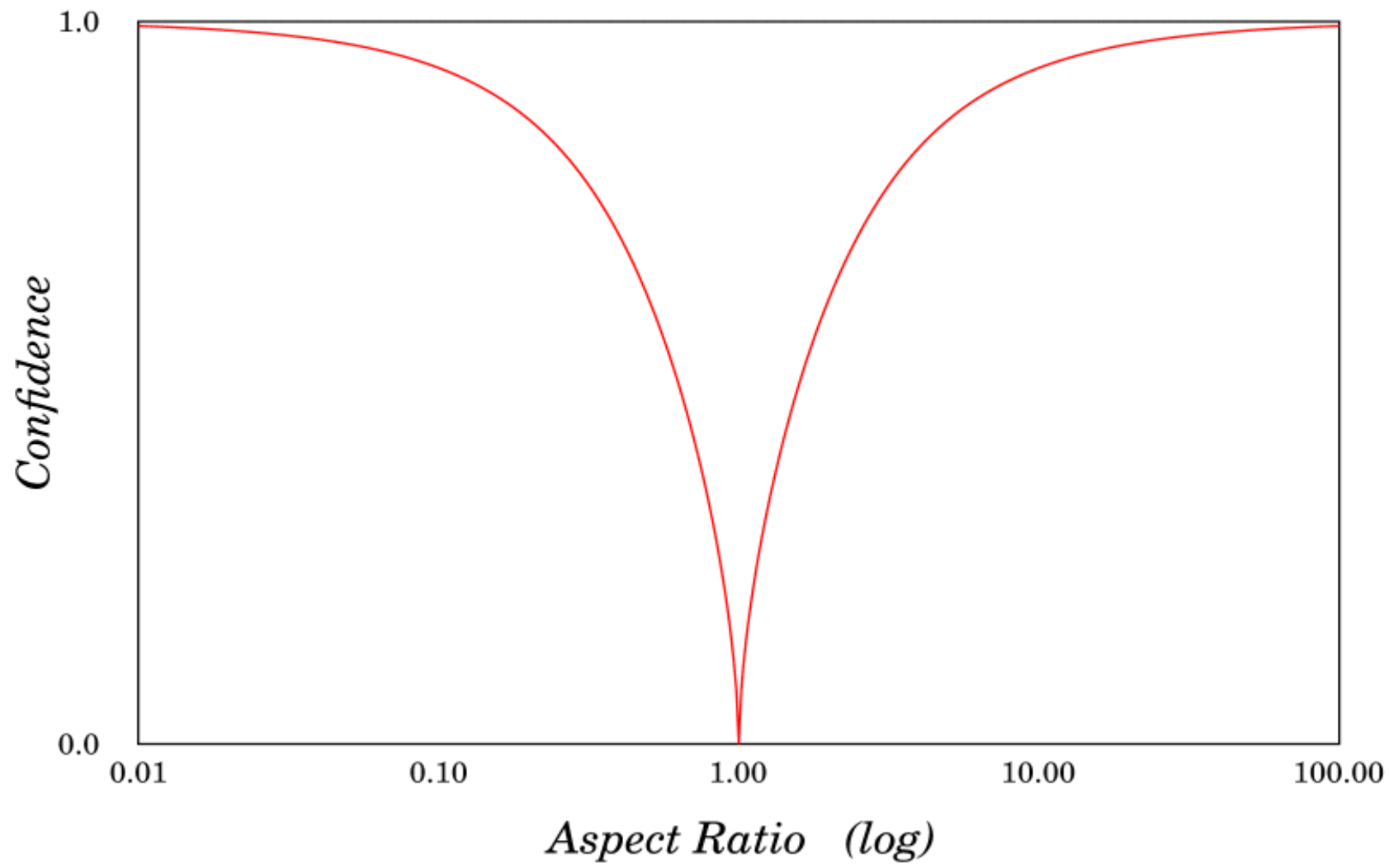


X	Y
0.0	1.0
10.0	1.0
100.0	0.0

Centroid_Dist

Fuzzy Logic

- *Attributes*
- *Interest Maps*
- *Confidence Maps*



Fuzzy Logic

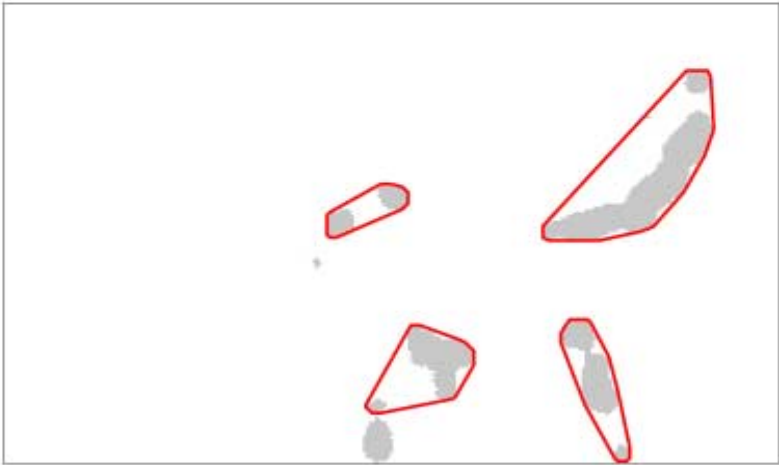
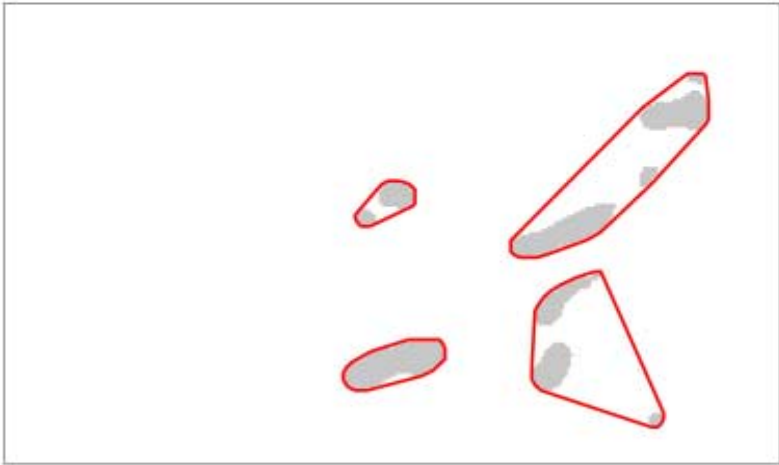
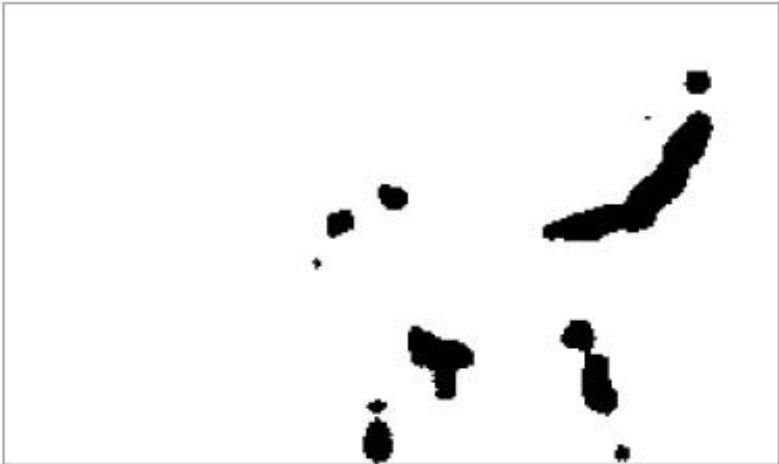
- *Attributes*
- *Interest Maps*
- *Confidence Maps*
- *Weights*

Total Interest

$$T(\alpha) = \frac{\sum_i w_i C_i(\alpha) I_i(\alpha_i)}{\sum_i w_i}$$

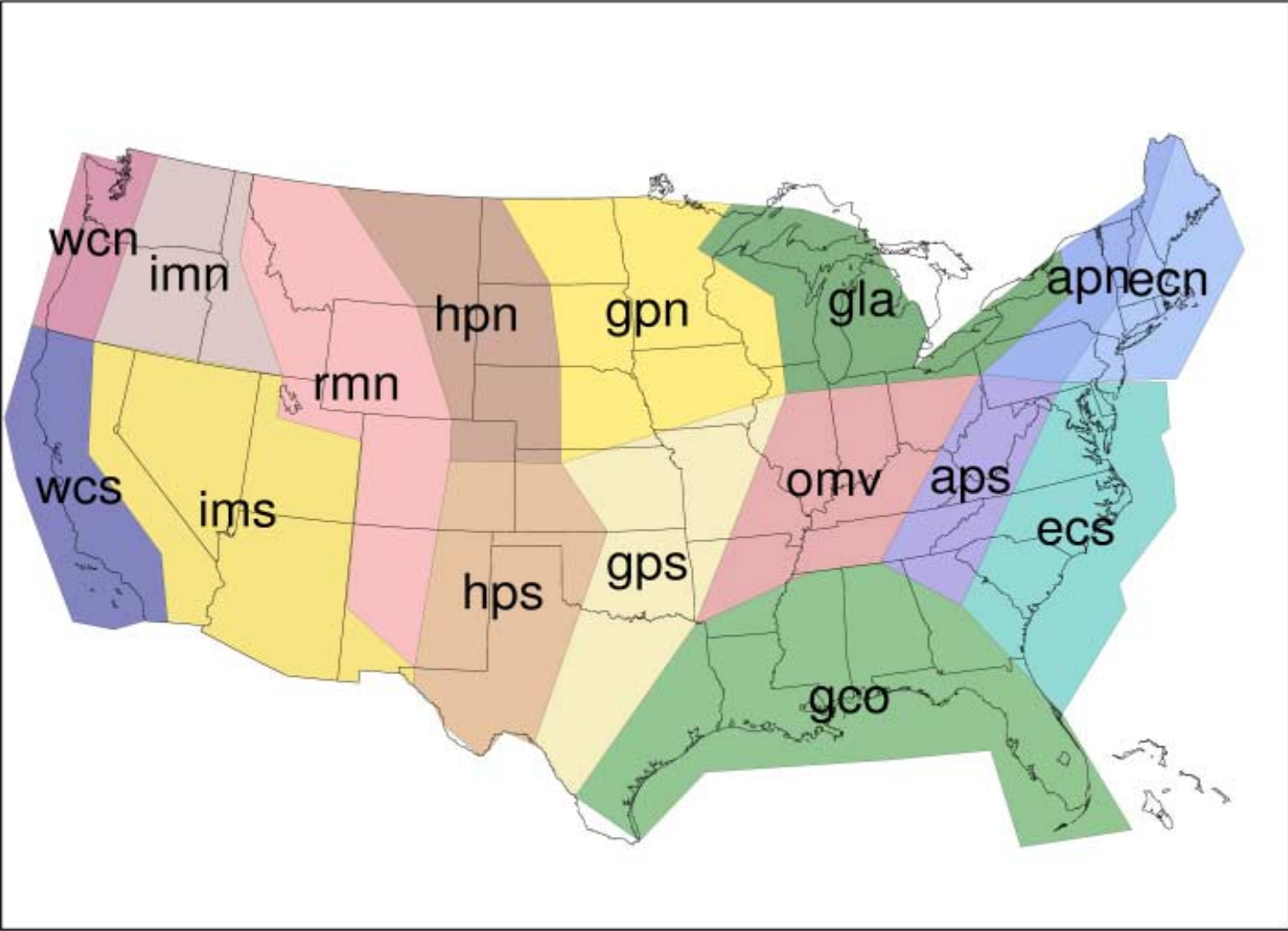
Valid Jul 2, 2001 0h

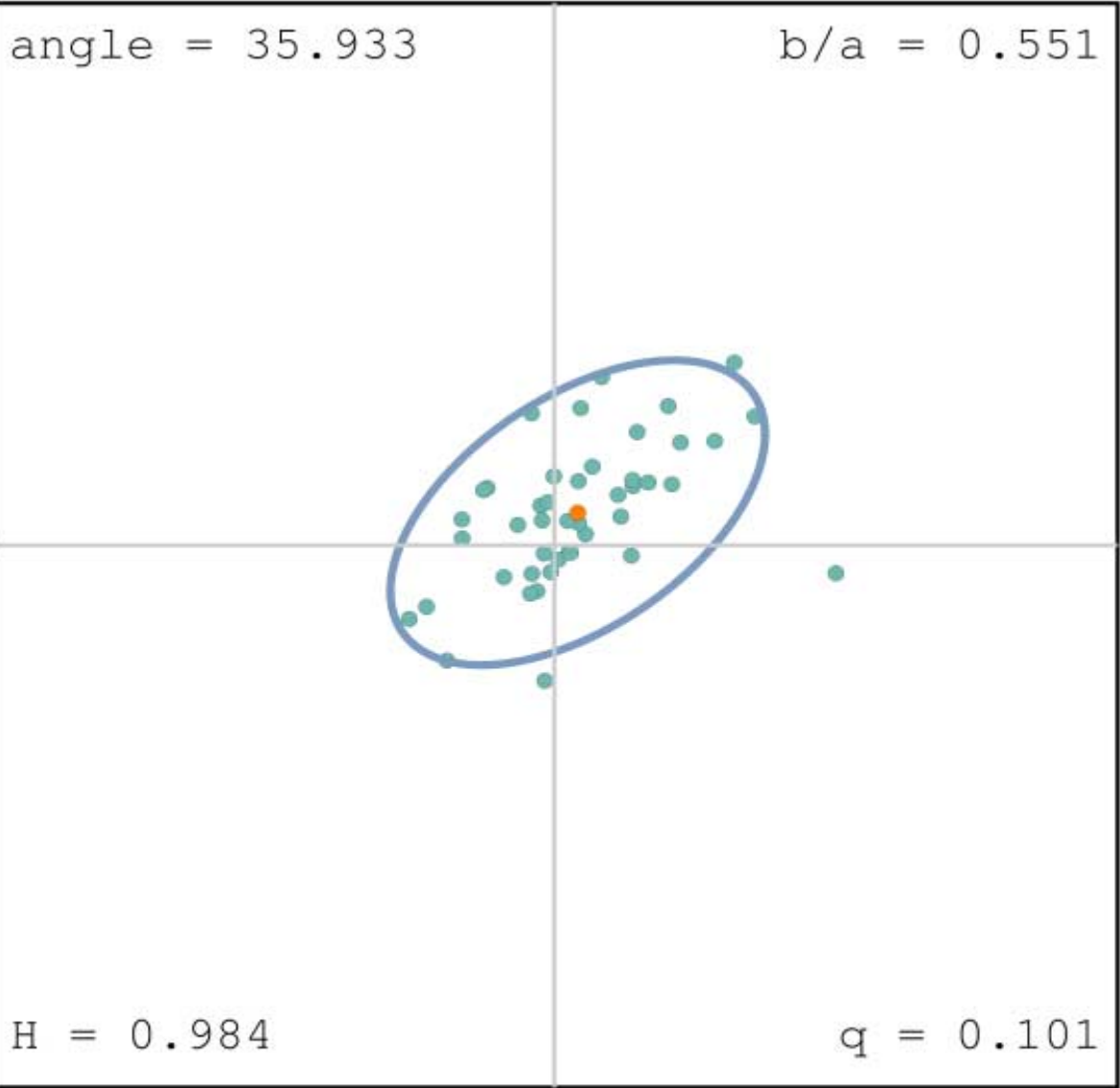
Lead 12h



Wrf

Stage 4

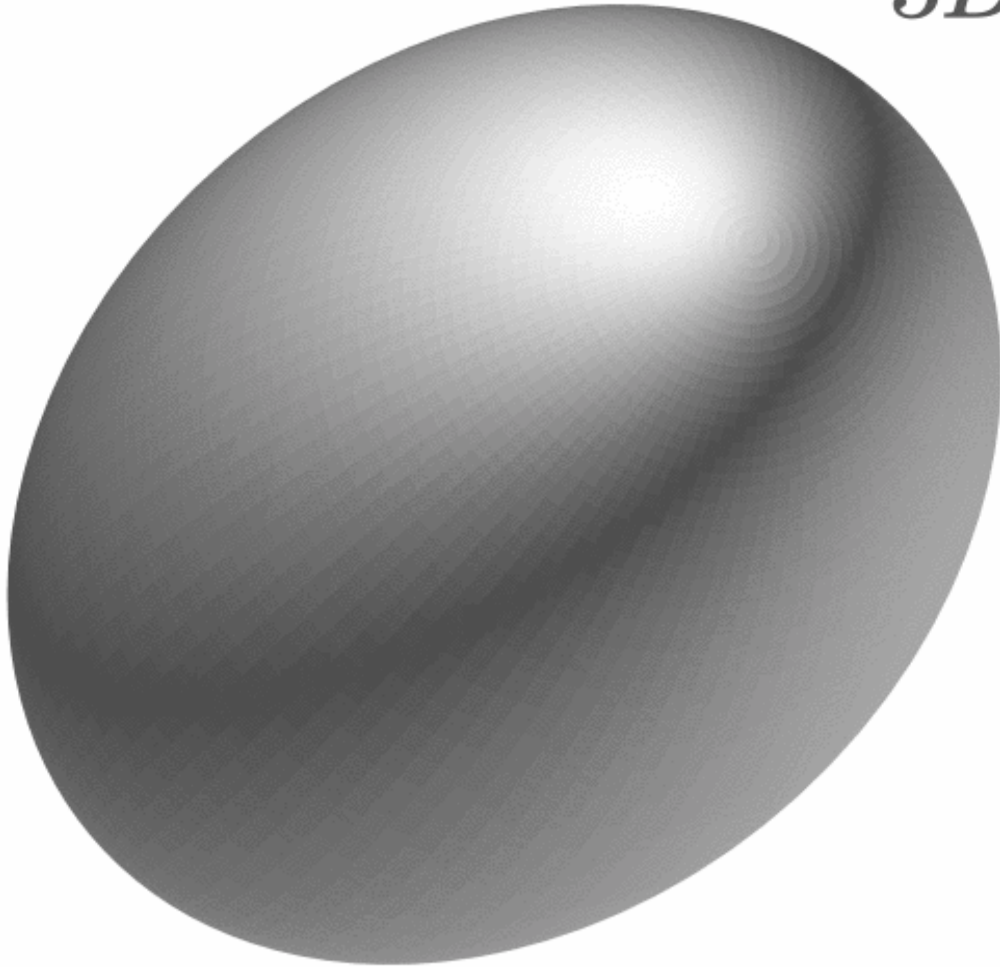




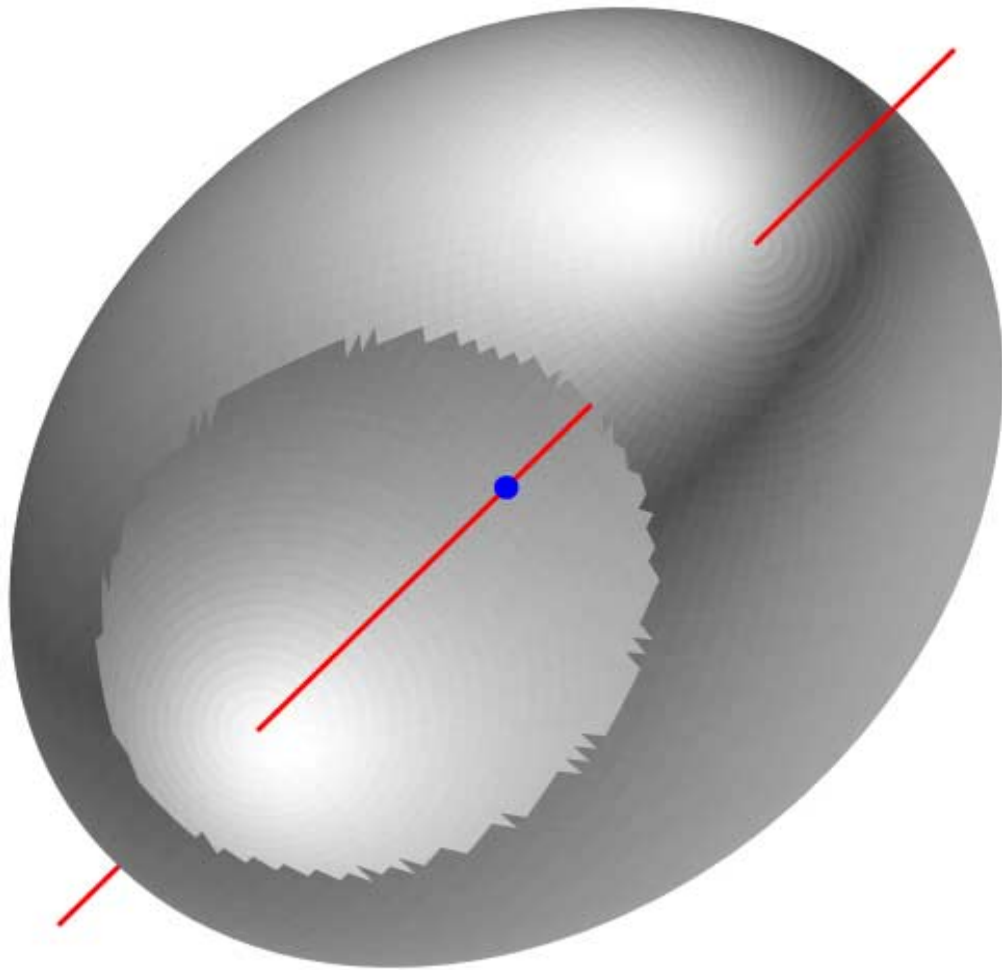
app

44 points

3D Object



(Potato)

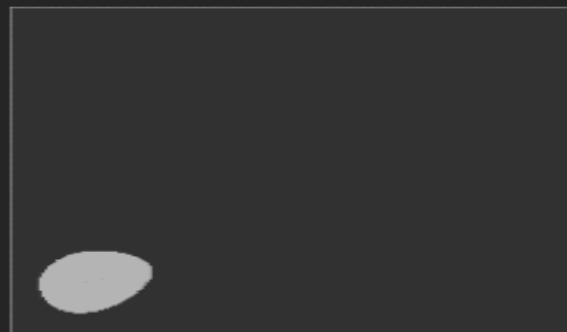
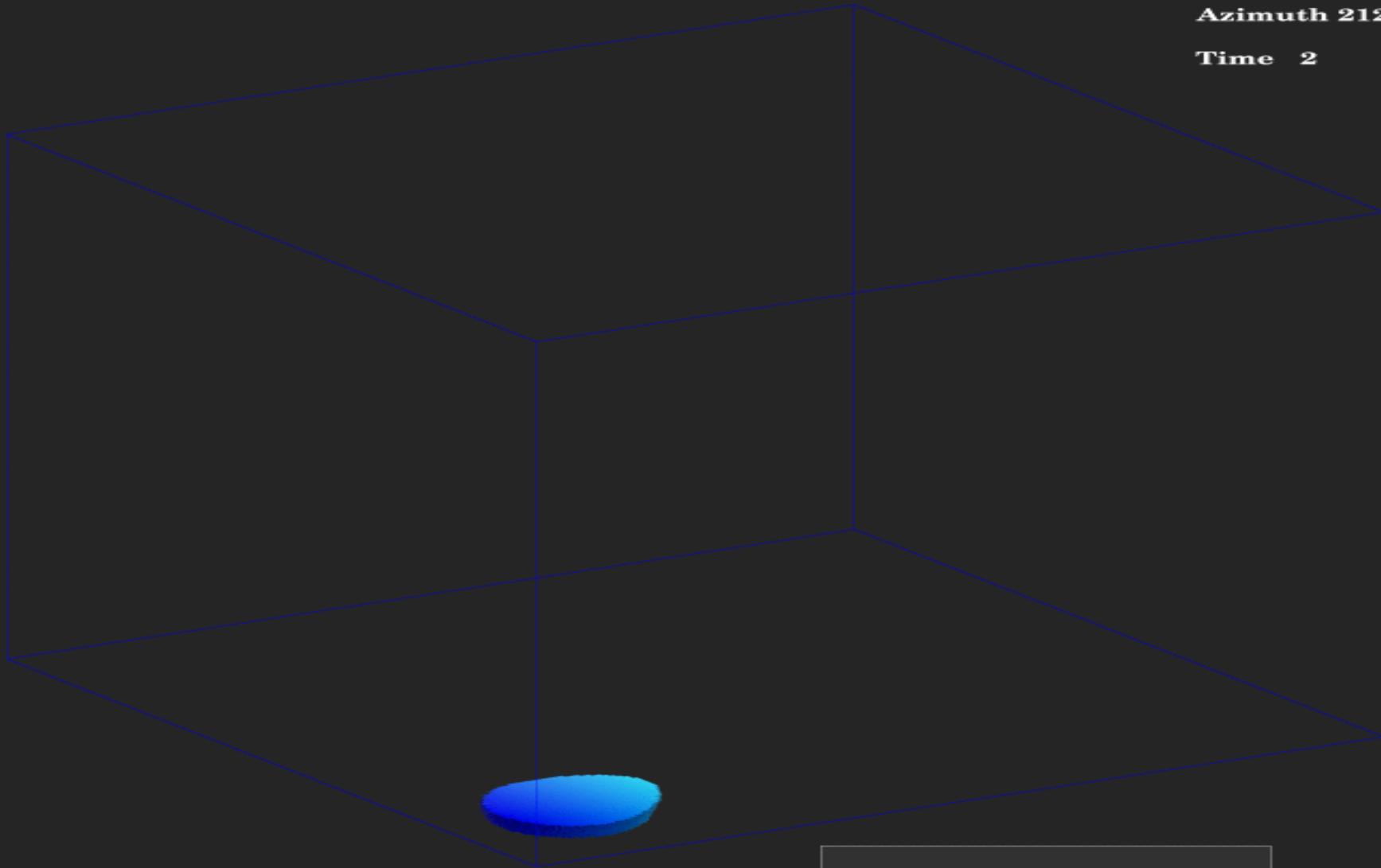


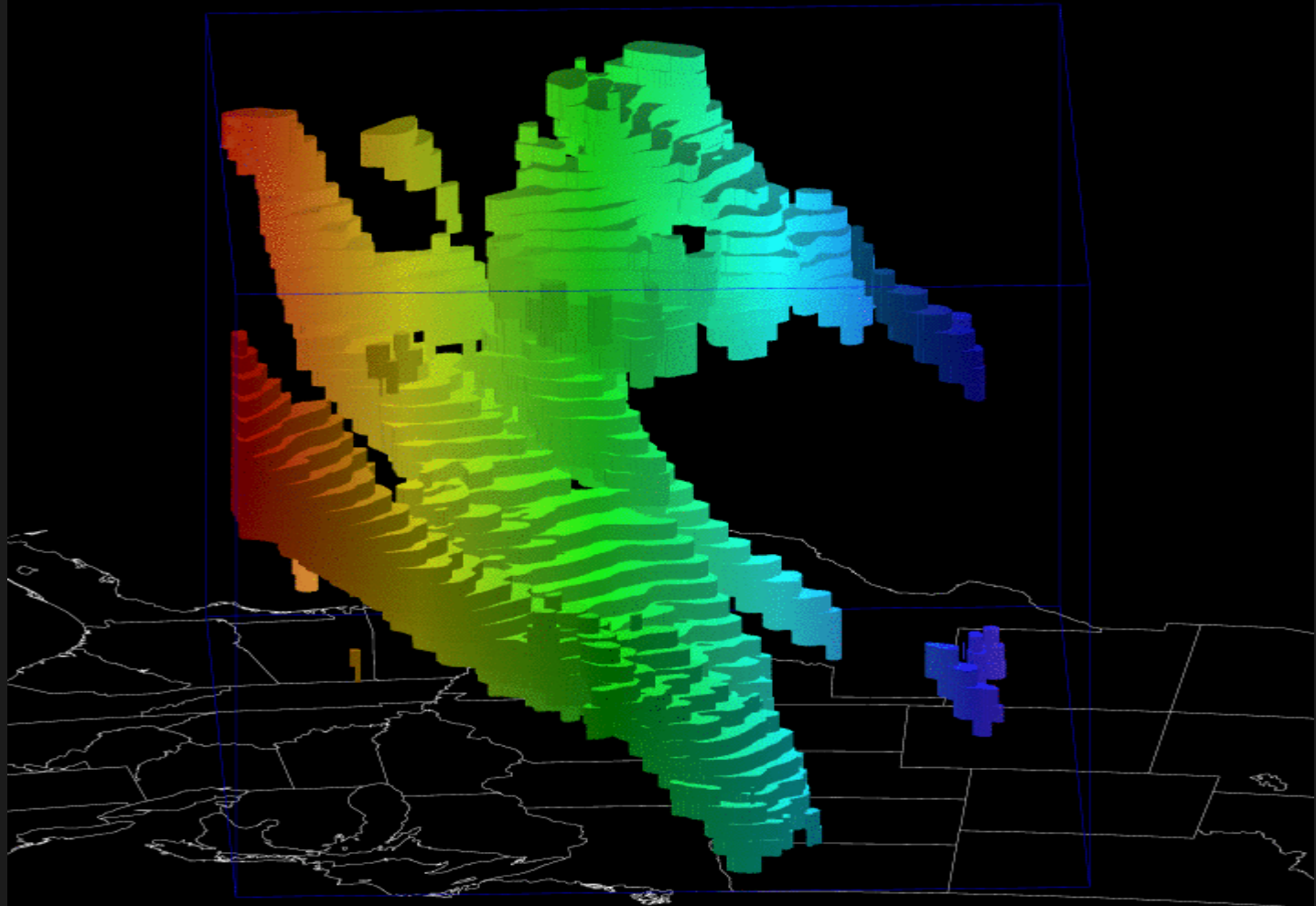
Centroid

and Axis

Azimuth 212

Time 2





Acknowledgments

- *Jamie Braid*
- *Matt Pocernich*
- *Anne Holmes*