Observation of TeV gamma rays from NE-rim of SN1006 with CANGAROO-II 10m telescope

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and CANGAROO collaboration

DATA of April-May 2000

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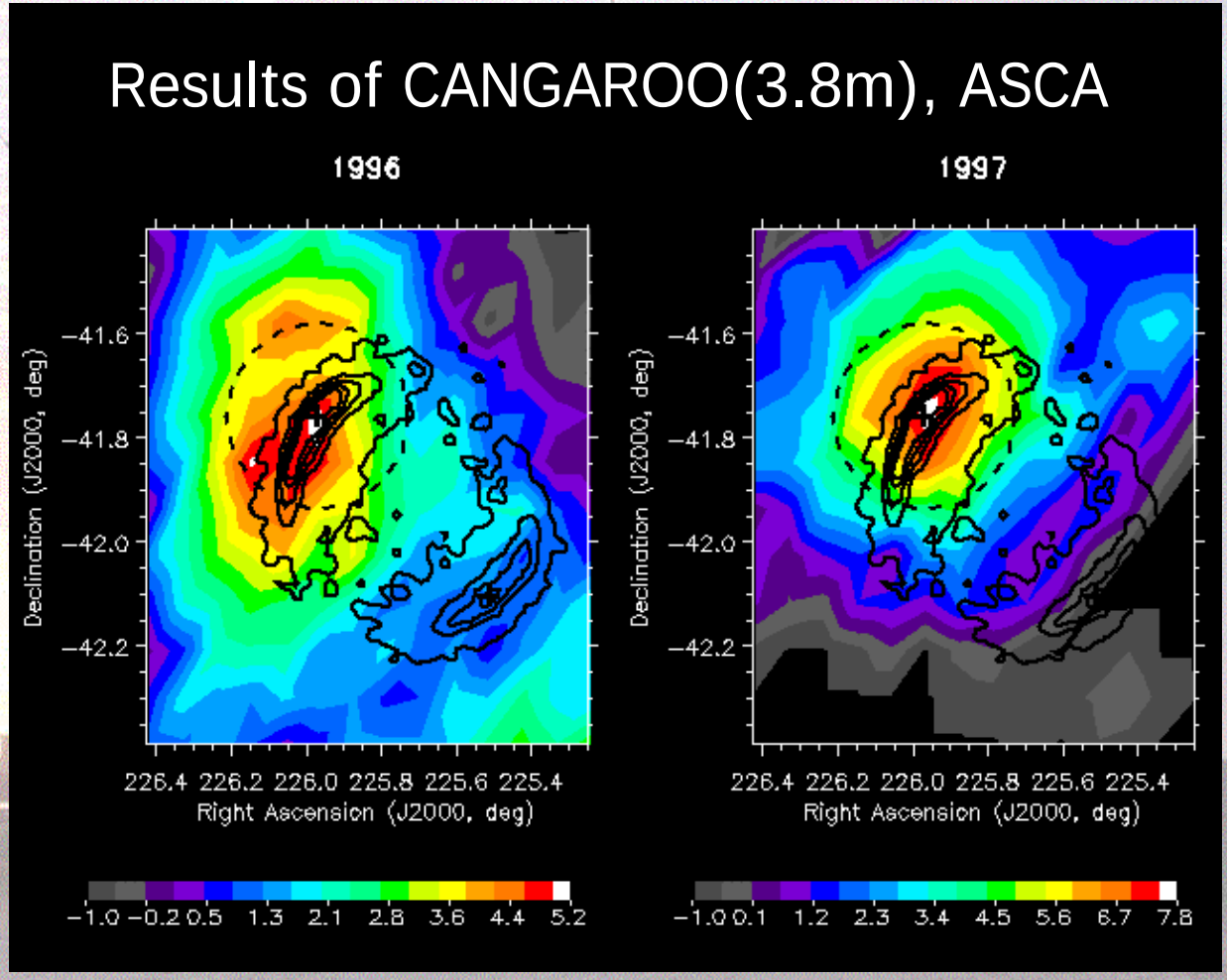
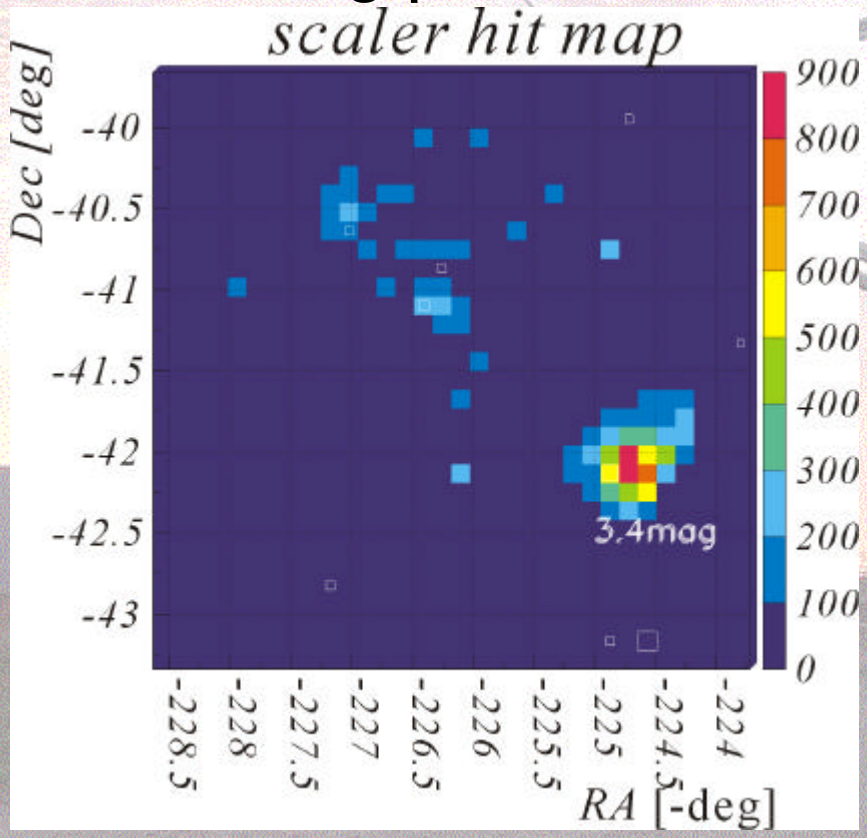
Supernova remnant SN1006

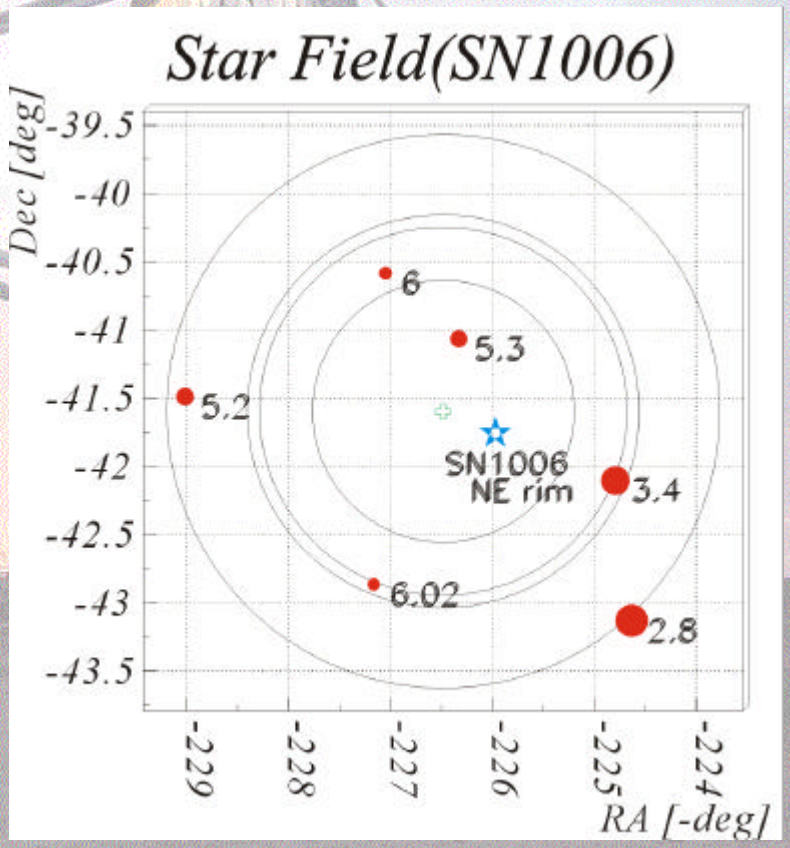
- A.D.1006
- G327.6+14.6
- Distance ~2 kpc
- Type 1a
- No pulsar
- γ-ray was detected by CANGAROO 3.8m telescope



Observation condition

- Bright 3.4 magnitude star
  at 0.9 deg position from NE-rim





To avoid star, tracking position was shifted 0.3~0.4 deg

Observation condition

- Detention Centre effect

Photo by CCD digital camera during observation

Noise photons : 3 ~ 5 times to good dark sky condition.

Observation was done with high trigger level !!

Observation time

- Data were selected by shower rate variation to keep the effects of whether conditions small

A.D.2000			Selected
April	ON	13.6h	11.2h
	OFF	14.9h	11.3h
May	ON	41.6h	41.0h
	OFF	33.9h	33.6h
Total	ON	55.2h	52.2h
	OFF	48.8h	44.9h

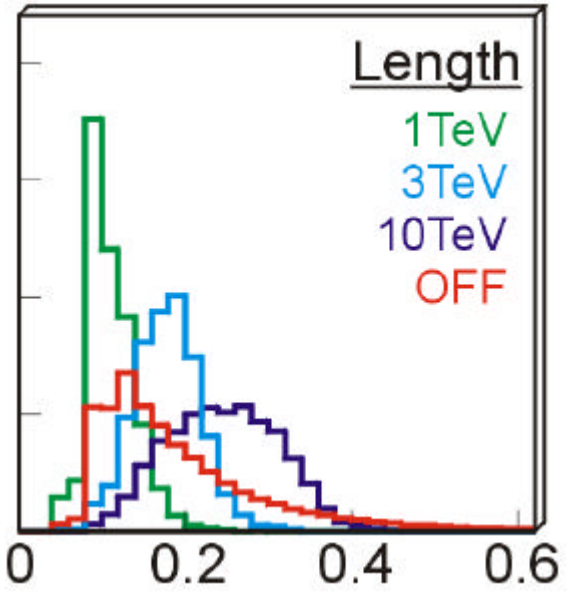
Image-cut criteria

Common cut

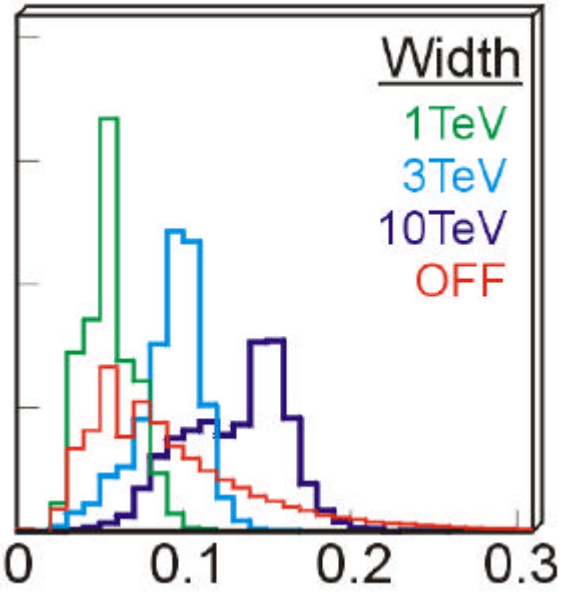
- 0.5 < Distance < 1.2
- Length < Distance
- Alpha < 15.0
- Most energetic cluster only

Energy depend cut

- Length
- Width
- Divided by charge amount



γ simulation
vs.
OFF-source data



γ-ray signal excess

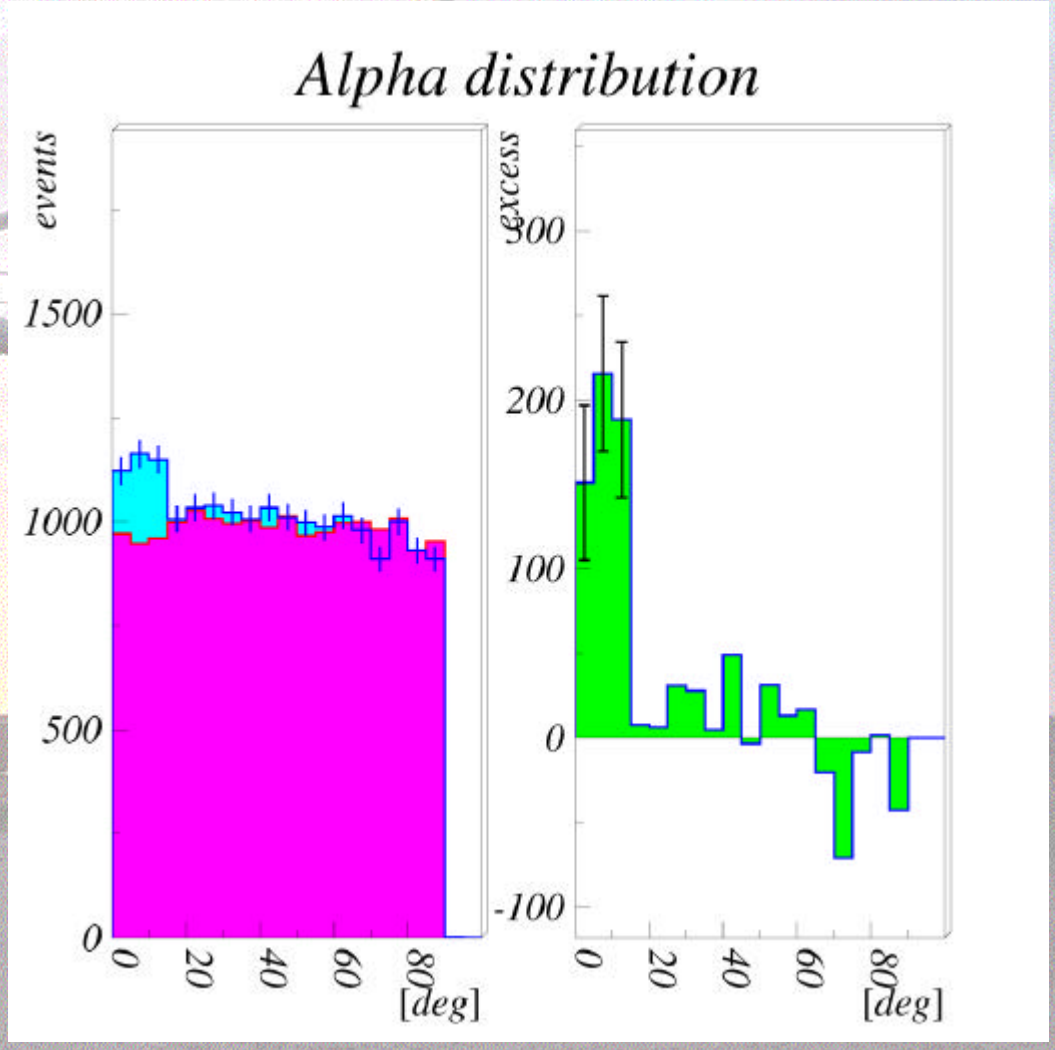
- Significance level

  7.0 σ

- Excess event

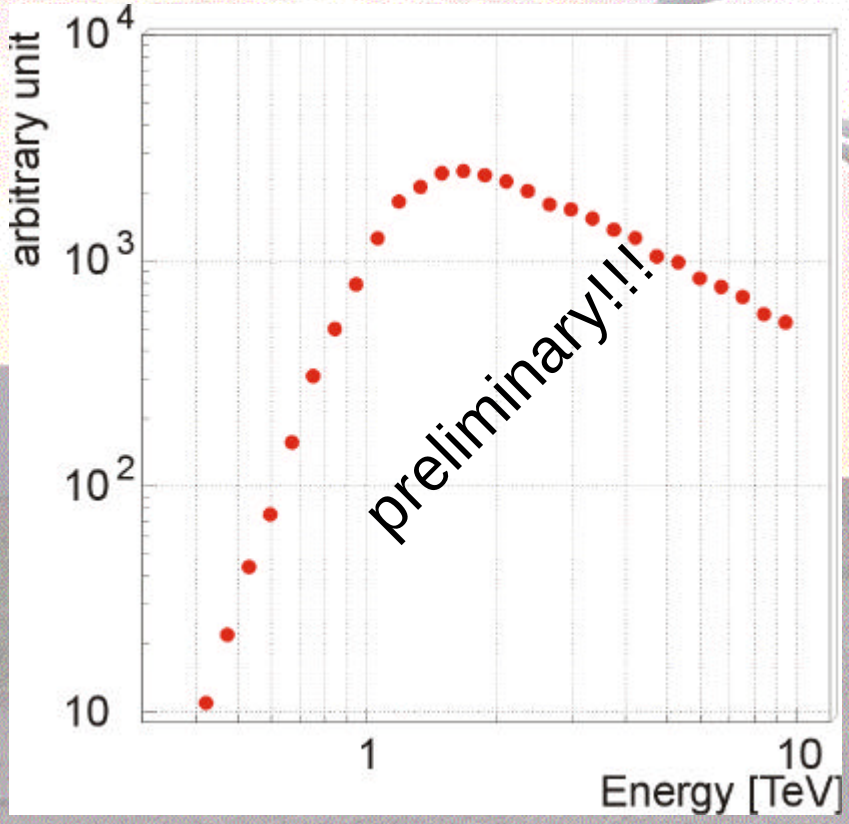
  555 ±79.5(stat)

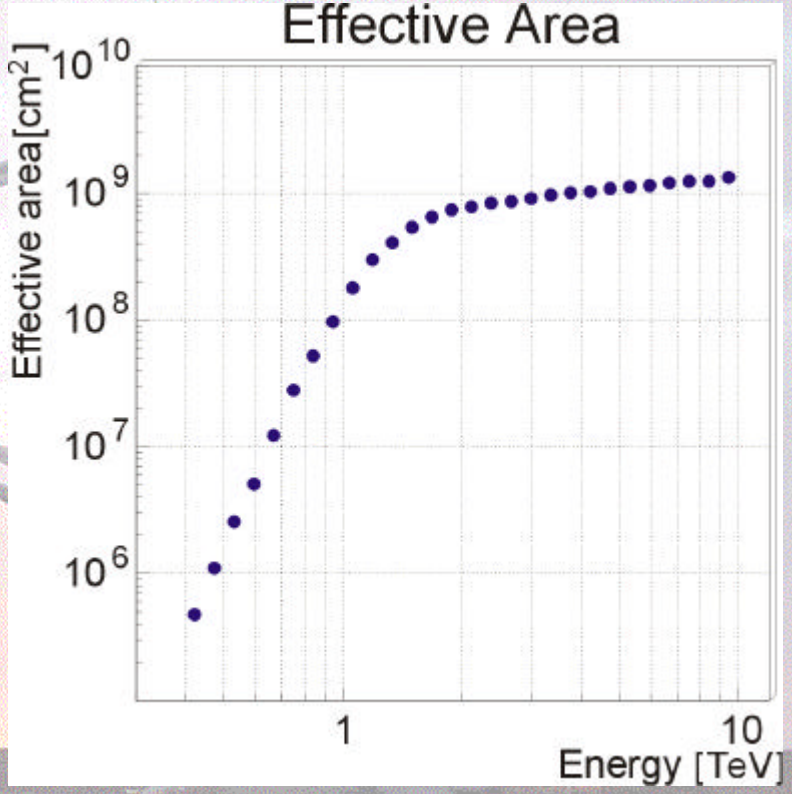
B / ON-source
R / OFF-source
G / residual



Detection energy threshold

- Detection effective area
- Assuming flux index ~ -2.3





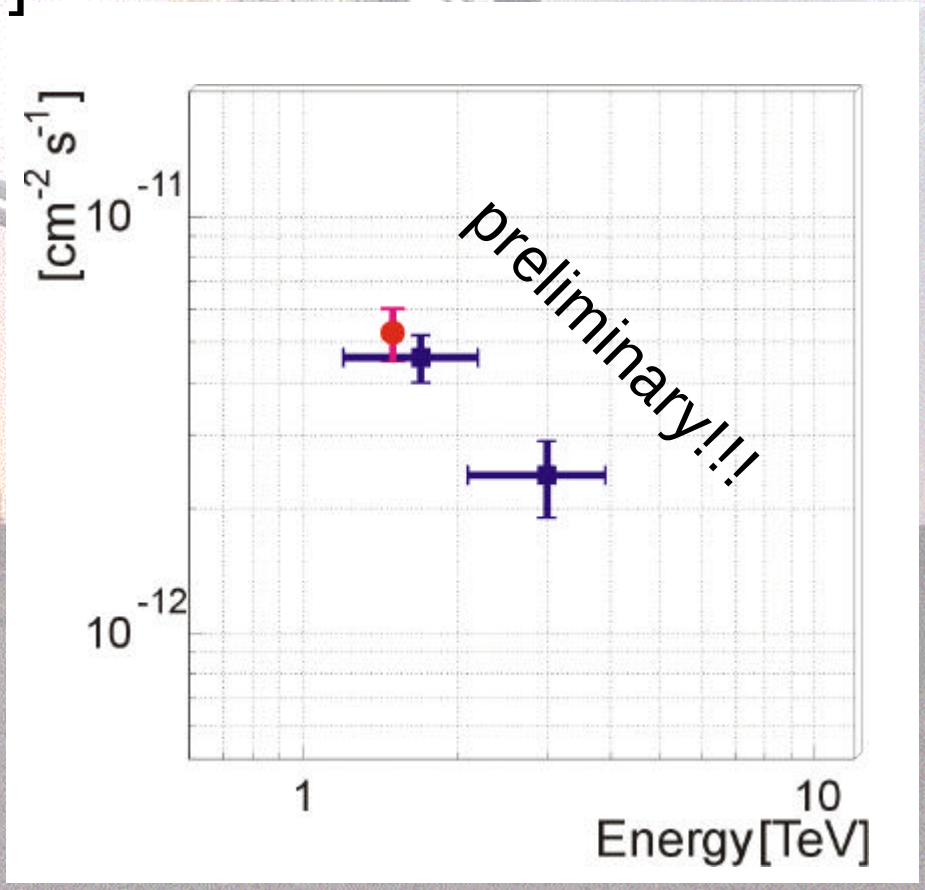
Energy threshold ~1.5 TeV

High cut level

for Night Sky Background noise

Integral flux

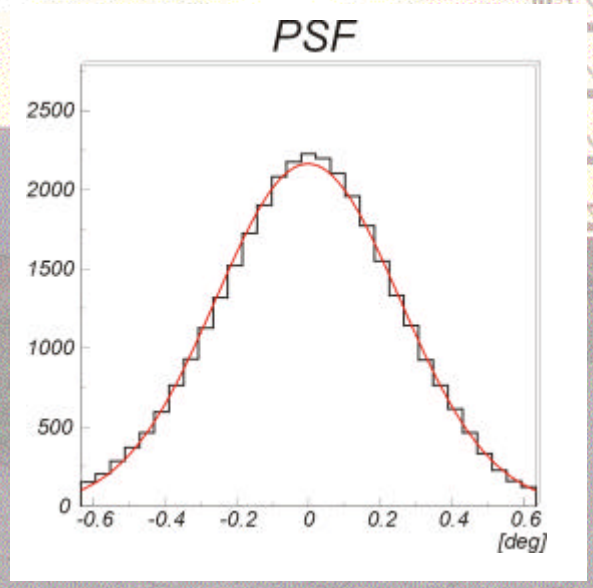
- Integral flux is estimated to be
  $5 \pm 1_{stat} \times 10^{-12}$ [cm^{-2} sec^{-1}]
  (>1.5TeV, index ~ –2.3)

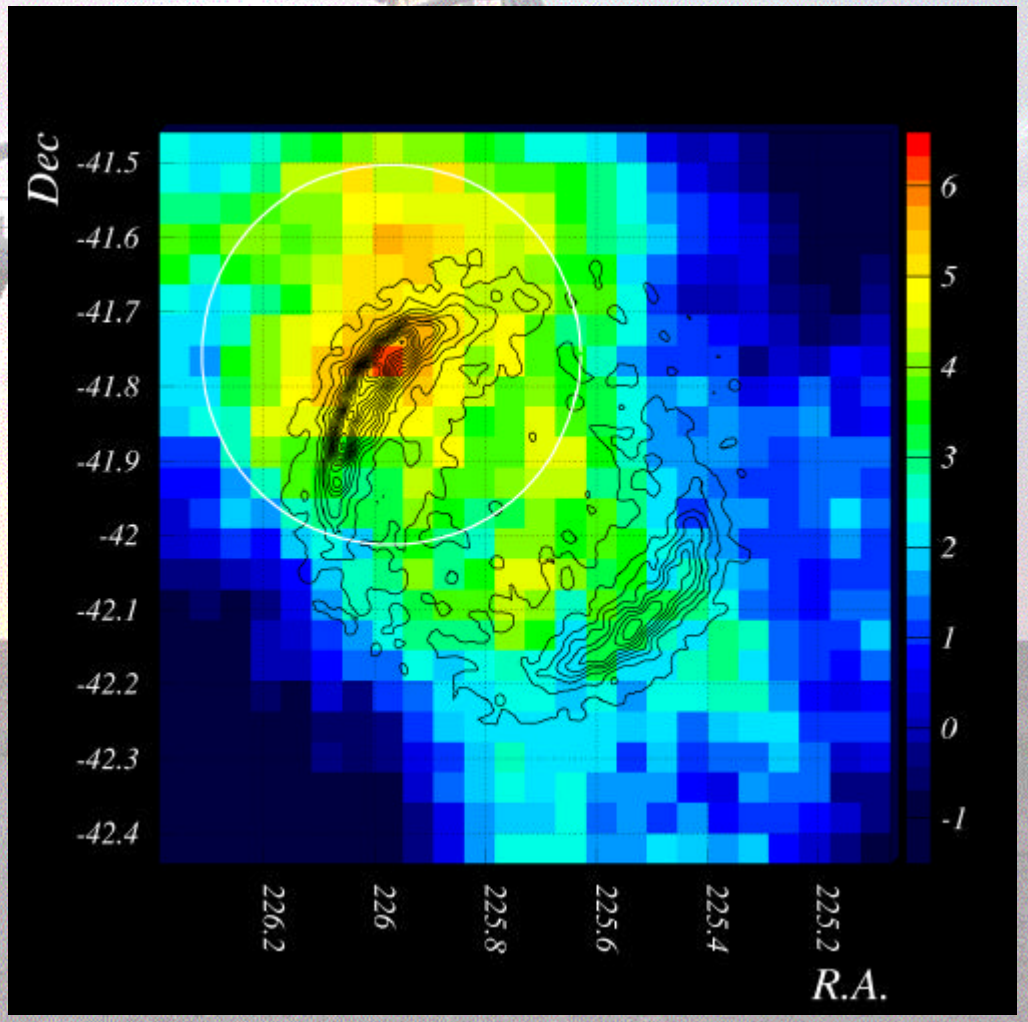


B / CANGAROO 3.8m
R / this analysis

Significance map

- Map of significance level σ with hard X-ray image (ASCA)
- Point spread function is estimated to be 0.25 deg radius





Summary

- SNR SN1006 was observed in April / May 2000 with CANGAROO-II 10m telescope.
- γ-rays are detected again from the same position with detection energy threshold ~1.5 TeV.
- Integral flux is estimated to be
  $5 \pm 1_{stat} \times 10^{-12}$ cm^{-2} sec^{-1} (>1.5TeV)
  #preliminary result.
- This result is consistent with 3.8m telescope result.