COUNCIL MEMO No. 21

NATIONAL RADIO ASTRONOMY OBSERVATORY
Socorro, New Mexico

VLB ARRAY MEMO No. 438

To: NRAO Council
From: Craig Walker
Subject: Antenna in Green Bank

Green Bank was not used in the VLBA configuration because none of the best arrays that used the maximum available extent of the United States (ie, used New England) and that were centrally condensed with the short baselines near the VLA included Green Bank. All efforts to either move the Northeastern antenna to Green Bank or to use Green Bank in addition to a New England antenna resulted in inferior uv coverage.

A problem in the current argument is that there is no generally accepted, quantitative measure of goodness of uv coverage. I only trust the measures that have been used to rank arrays. Therefore, there is no clean answer to such questions as "How much is the coverage degraded when the OVRO station is moved to Green Bank?". About the best that I can do is show plots of the uv coverage and point out the degradations that occur.

The attached figures show the uv coverage of the current configuration, a configuration with the OVRO site moved to Green Bank, and a configuration with the Haystack site moved to Green Bank. All three are shown on scales of 8000 km and 2000 km. When looking at holes, it is important to remember that holes that are a large percentage of the uv distance are more serious than holes that may be larger but are farther out in the uv plane so that they are a smaller fraction of the uv distance.

Moving the OVRO site opens up a large percentage hole at about 1000 km, visible on the 2000 km plots. Moving OVRO also biases the uv coverage more toward long baselines. These changes will make observations at low resolutions, as are needed for some science, more difficult. Remember that the demand for the low resolution configurations of the VLA is as high as for the A array.

Moving the Haystack site to Green Bank opens holes at about 2000 km but does not change the centrally condensed nature of the coverage. The holes are not as large in percentage of uv distance as those introduced by moving OVRO but they are certainly significant.

In anticipation of the discussion of Green Bank, I ran my optimization program with Green Bank as a forced station. I allowed it to choose any three sites from among Owens Valley, Oroville, Iowa, Haystack, Duluth, Boise, Bangor, Halifax, and Newfoundland. Somewhat to my surprise, the best array had the first three stations listed - it corresponds to just moving Haystack to Green Bank. The performance was not as good as the current configuration as expected.

In summary, if an antenna must be put in Green Bank, I would recommend that it be the one that would have gone to Haystack. This has the additional advantages that it solves the problems that we are having trying to find a site in New England that is free of RFI and it does not take one of our dry western sites and put it in a wet region. However the coverage will be worse as shown by the plots. Also it is frustrating to have this constraint applied this late date - if it had been forced earlier, I suspect the rest of the configuration would be somewhat different and have better performance (although definitely not as good as the current configuration).

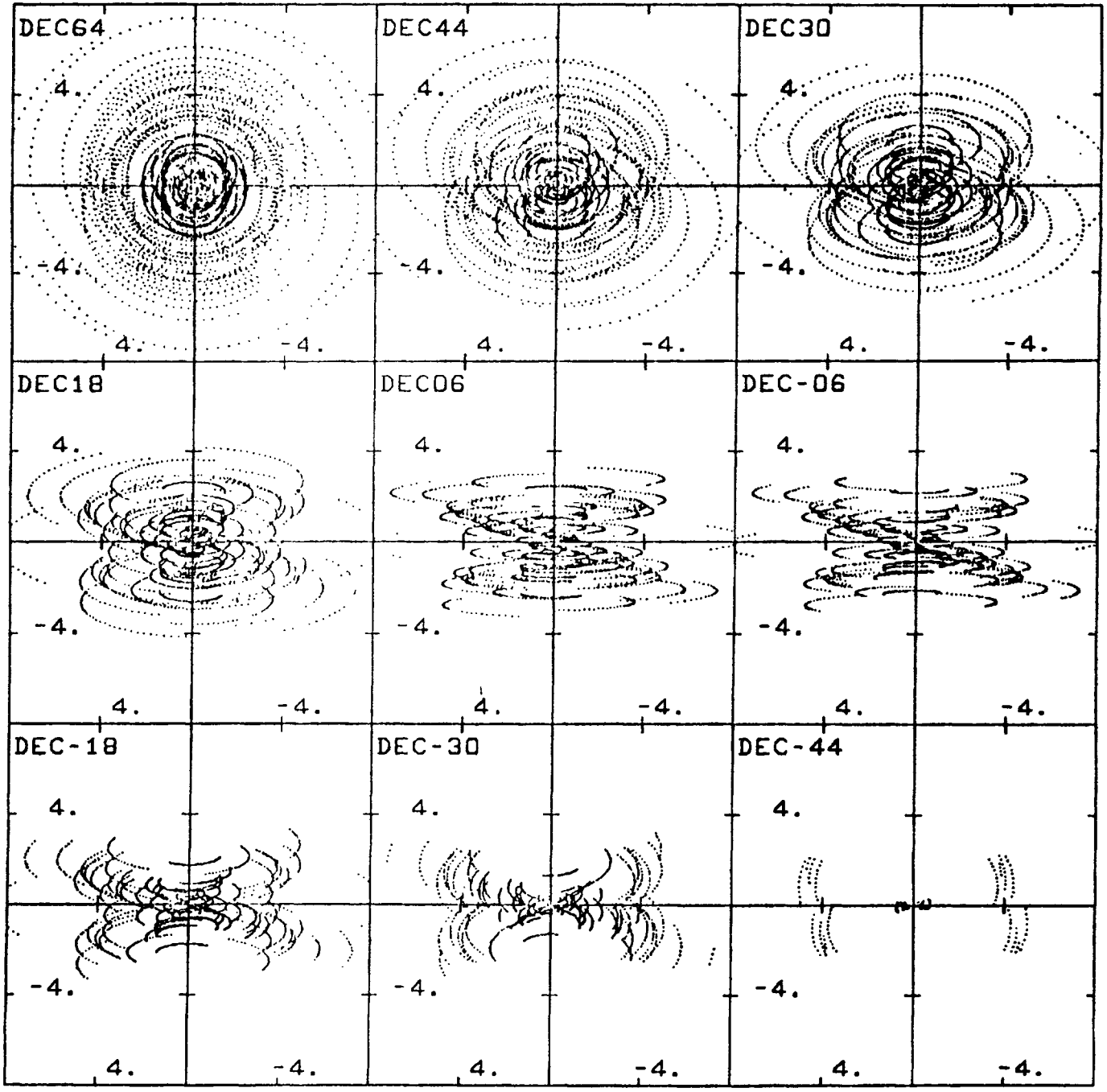
HAWAII	19.80	155.50
ARECIBO	18.34	66.75
HSTK	42.43	71.49
PIETOWN	34.33	108.14
LASL2	35.81	106.27
OVRO	37.05	118.28
OROVILE	48.90	119.75
IOWA	41.58	91.57
FDVSNEW	30.47	103.95
KITT	31.96	111.60

Scale in km
(kilometers x 10^3)

VLBA

8000 km max

1a



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Scale in km
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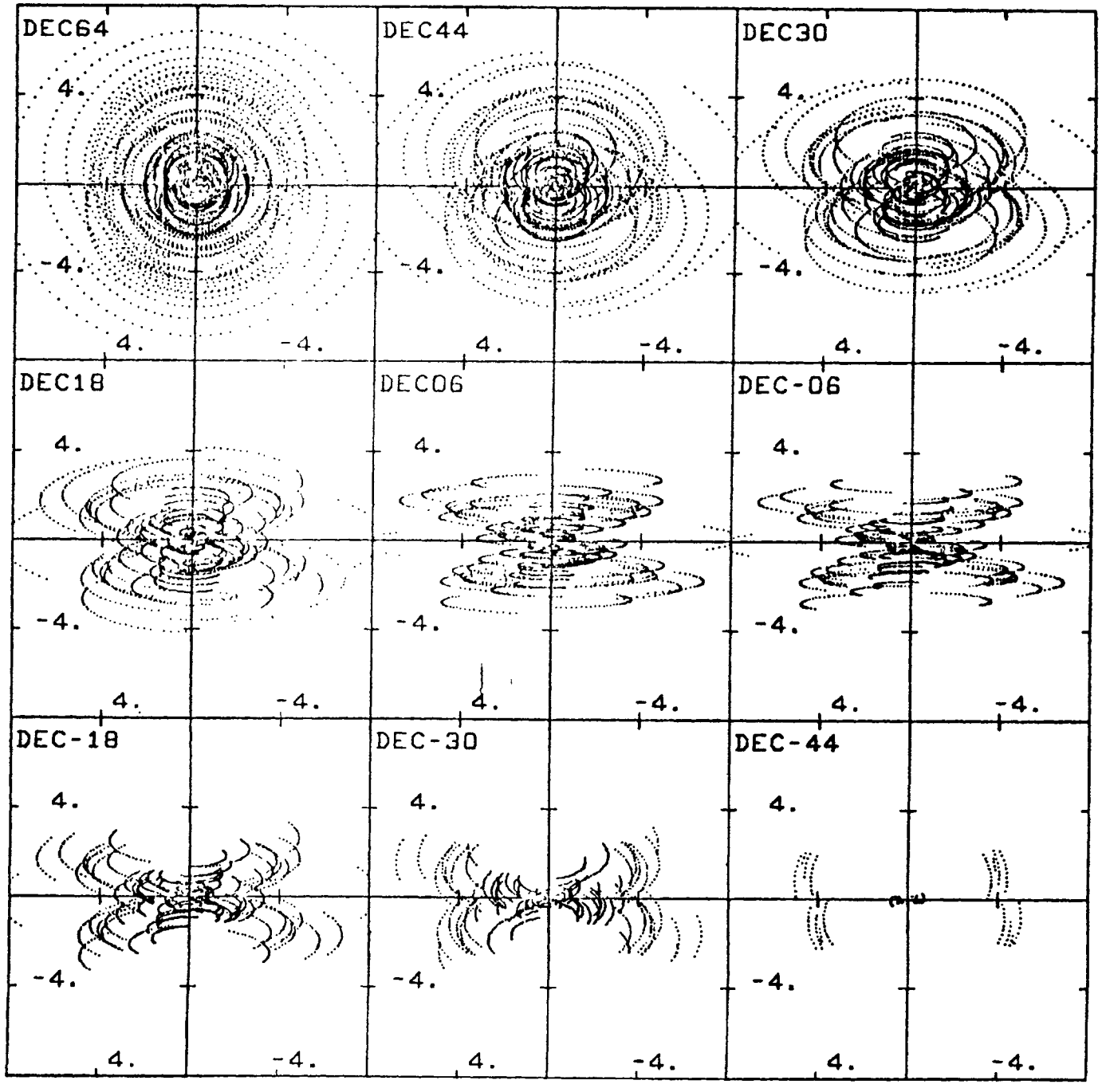
HSPK→VLA 10
8000 km max

16



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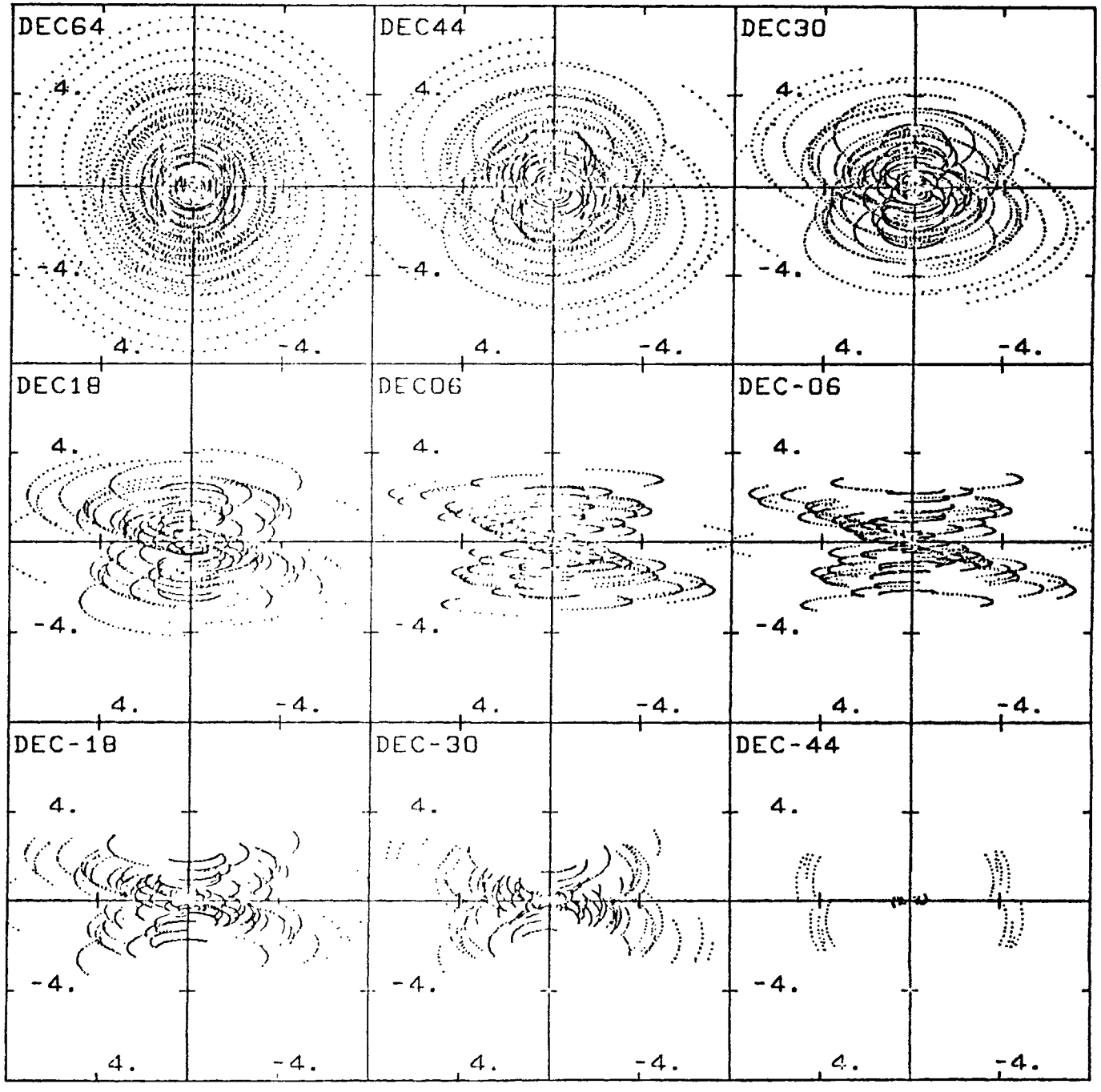
Scale in km
kilometers x 10^3)

OVRO → NRAO

8000 km max

1c



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Scale in km
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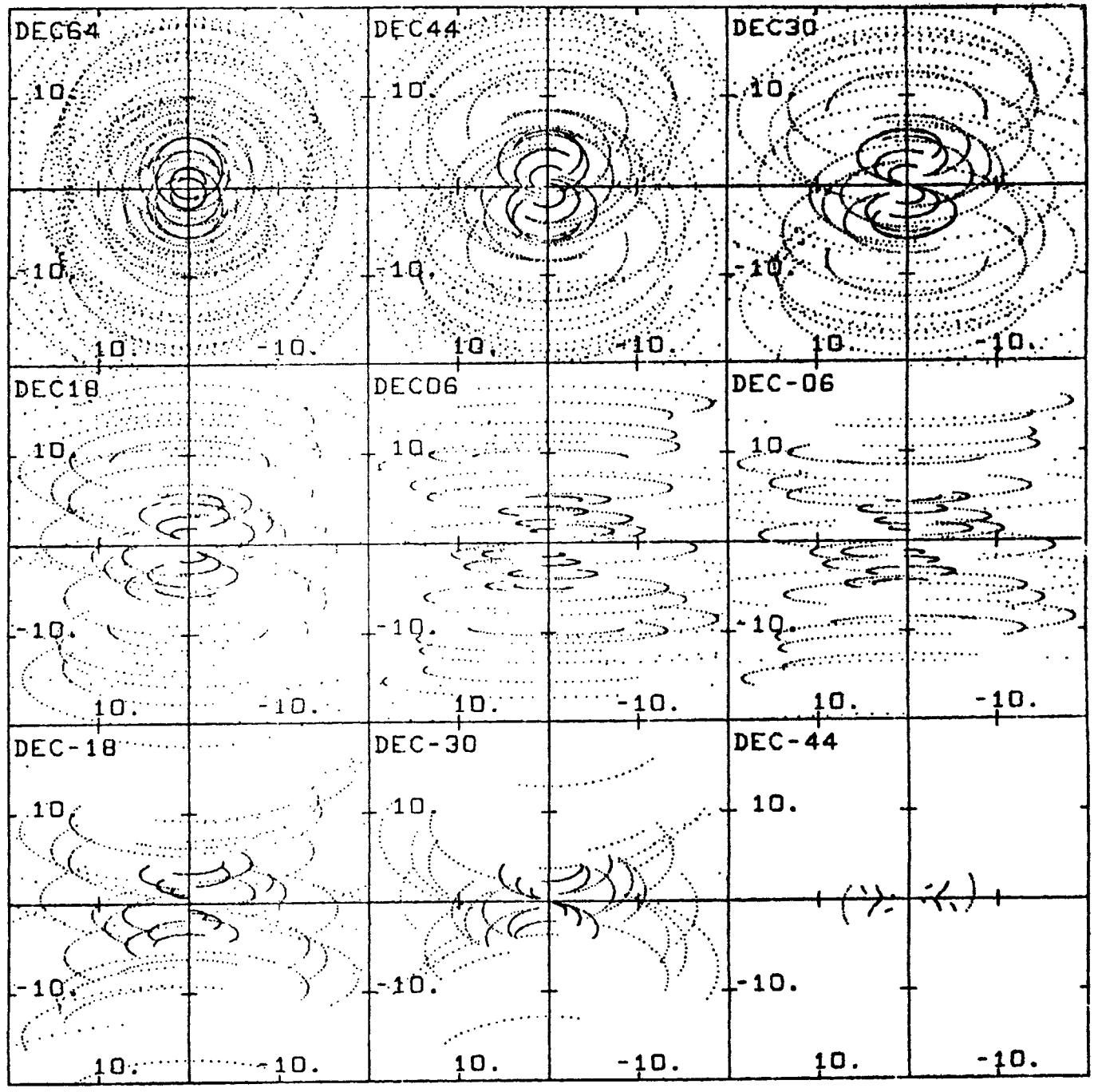
VLBA 2000 km max

2a



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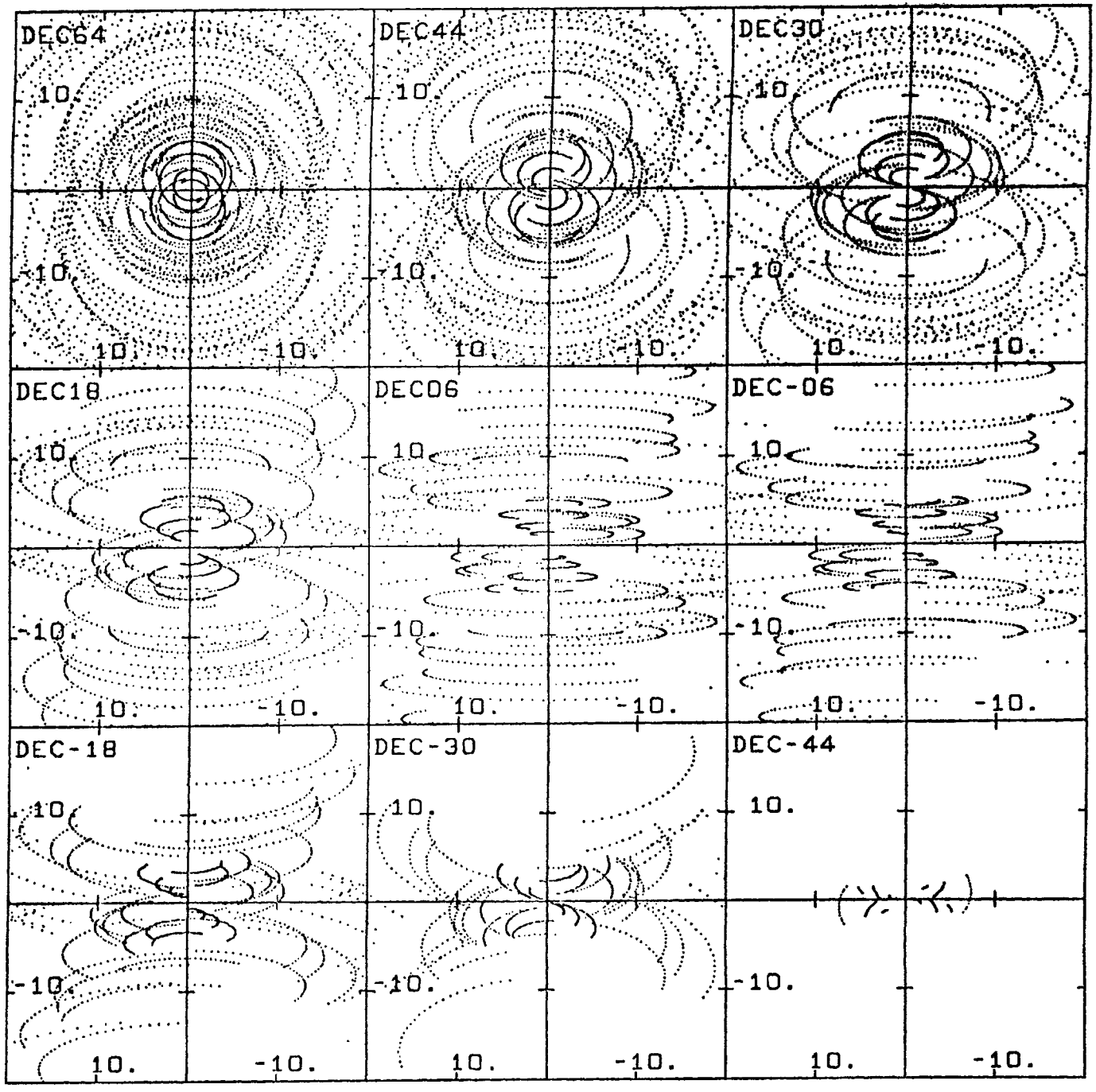
HSTK→NRAO

2000km max



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Scale in km
kilometers x 10^2)

VLA-NRAO 200 km max

2C