

National Radio Astronomy Observatory
Socorro, New Mexico

Aug. 21, 1987

To: Site Group
From: Craig Walker
Subject: Horizons revisited.

(Please note that this memo was supposed to be distributed last August but got lost somehow. The information should still be useful. Jan 1988)

This memo was provoked by 3 changes since Memo 576 on the same subject. First, an error in the math used in Memo 576 was found that affects the plots (perversely only at hour angles that are difficult to check). Second, the site in the Virgin Islands has changed. Third, a site on Mauna Kea is under consideration for Hawaii. The plots attached use the new sites in the Virgin Islands (labeled VI_ANG) and Hawaii (labeled Inoa Nele after Cam Wade's name for the site) and, hopefully, use more accurate equations.

Figure 1 shows the horizons for the VLBA sites. The solid lines are the actual horizons while dashed lines for a few stations show what the horizon would be if there were no obstructions. A source that is above a line can be observed by that station. A minimum elevation of 5 degrees was used. Note that the u-v studies used a 10 degree elevation limit at all sites.

Figure 2 shows the Hawaii, Virgin Islands, Owens Valley, and New England sites of the VLBA along with Bologna (a representative EVN station) and South Africa. Note that a source must be below the South Africa line in order to be observed as indicated by the hatching. This plot gives an indication of the mutual visibility of European stations and the VLBA and shows what might be done with South Africa for southern sources.

Figure 3 is similar to Figure 2 except that it emphasizes the interaction of the VLBA with Eastern stations with Parkes and Nobeyama serving as representative non-VLBA stations and the Washington and Owens Valley VLBA sites showing the usefulness of the western VLBA stations. Again the line for the southern station, Parkes, is an upper limit as indicated by the hatching.

The following are comments about some specific sites.

1. Owens Valley (VLBA_OV). The blockage is worst for sources between about 10 and about 50 degrees declination and occurs on source rise. This is a declination regime in which the u-v coverage of the array is good so the effects should not

be very severe. The Owens Valley horizon is not significantly restricted at low declinations where it is important to get all possible data.

2. Virgin Islands, Territorial lands site near Anglican Church (VI_ANG). The high horizon in the south at this site will not have much affect on pure VLBA observations. The largest effects are at declinations below -30 degrees where the VLBA coverage is very poor. The horizon competely excludes observations of sources that are between about -60 and -67 degrees that might be possible to observe otherwise. This is a region where the only mutual visibility is with southern stations of which there are very few so far.

3. Hawaii, Mauna Kea site (Inoa Nele). The horizon is high at this site both to the south and to the northwest. The blockage to the south will only affect observations with southern stations. No other VLBA stations can observe sources in the excluded region. The blockage to the northwest will have the largest impact on circumpolar observations of sources between about 65 and 75 degrees where several hours could be lost. This is not desirable, but may be the price that has to be paid for a good site.

I would conclude that, while no horizon blockage is desirable (other than to block RFI), the blockages shown in this memo are not sufficiently severe to preclude the use of the sites.

Period of Visibility for RA = 6.0 hr. Min elev = 5.0 deg.

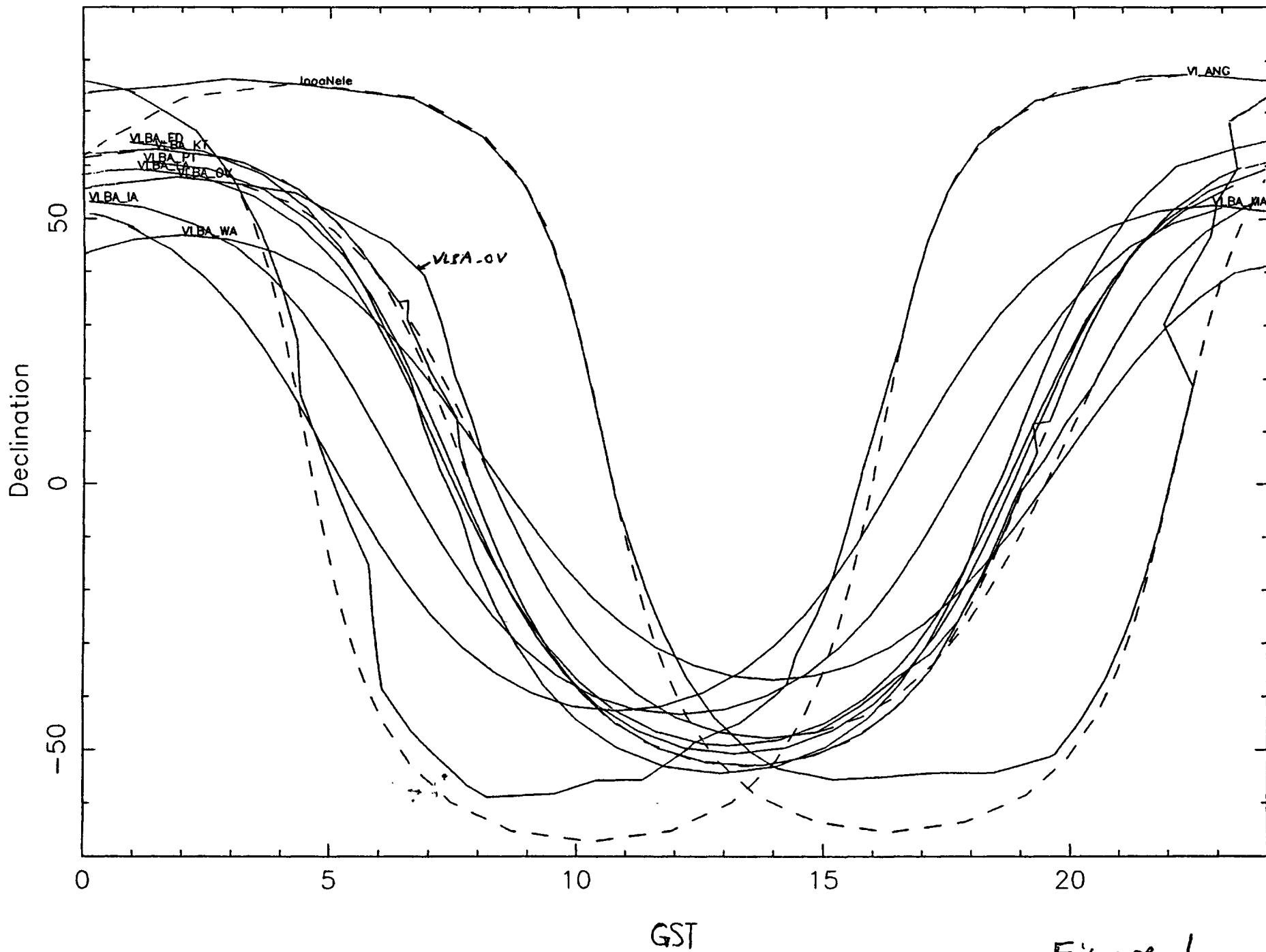


Figure 1

Period of Visibility for RA = 6.0 hr. Min elev = 5.0 deg.

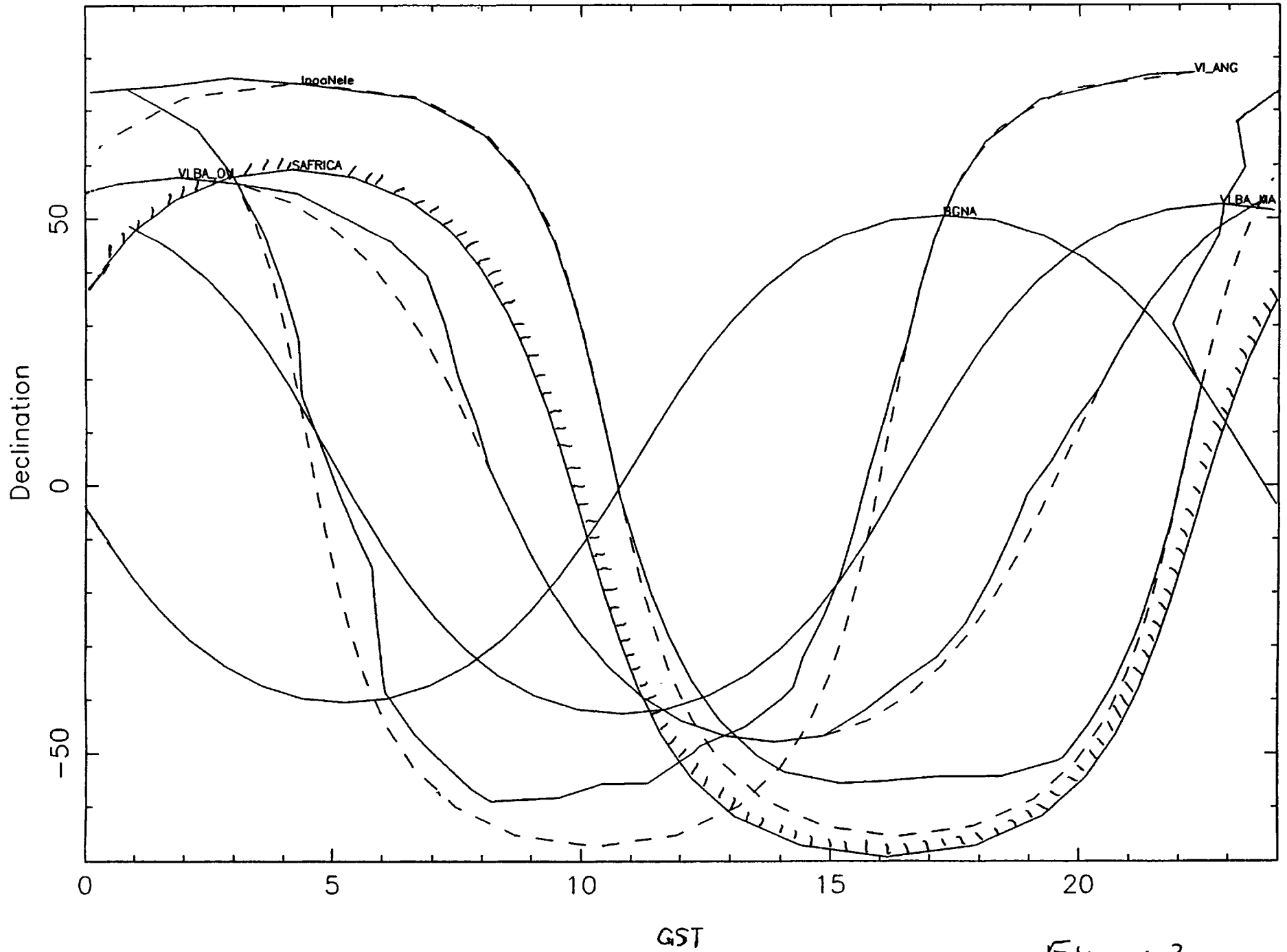


Figure 2

Period of Visibility for RA = 6.0 hr. Min elev = 5.0 deg.

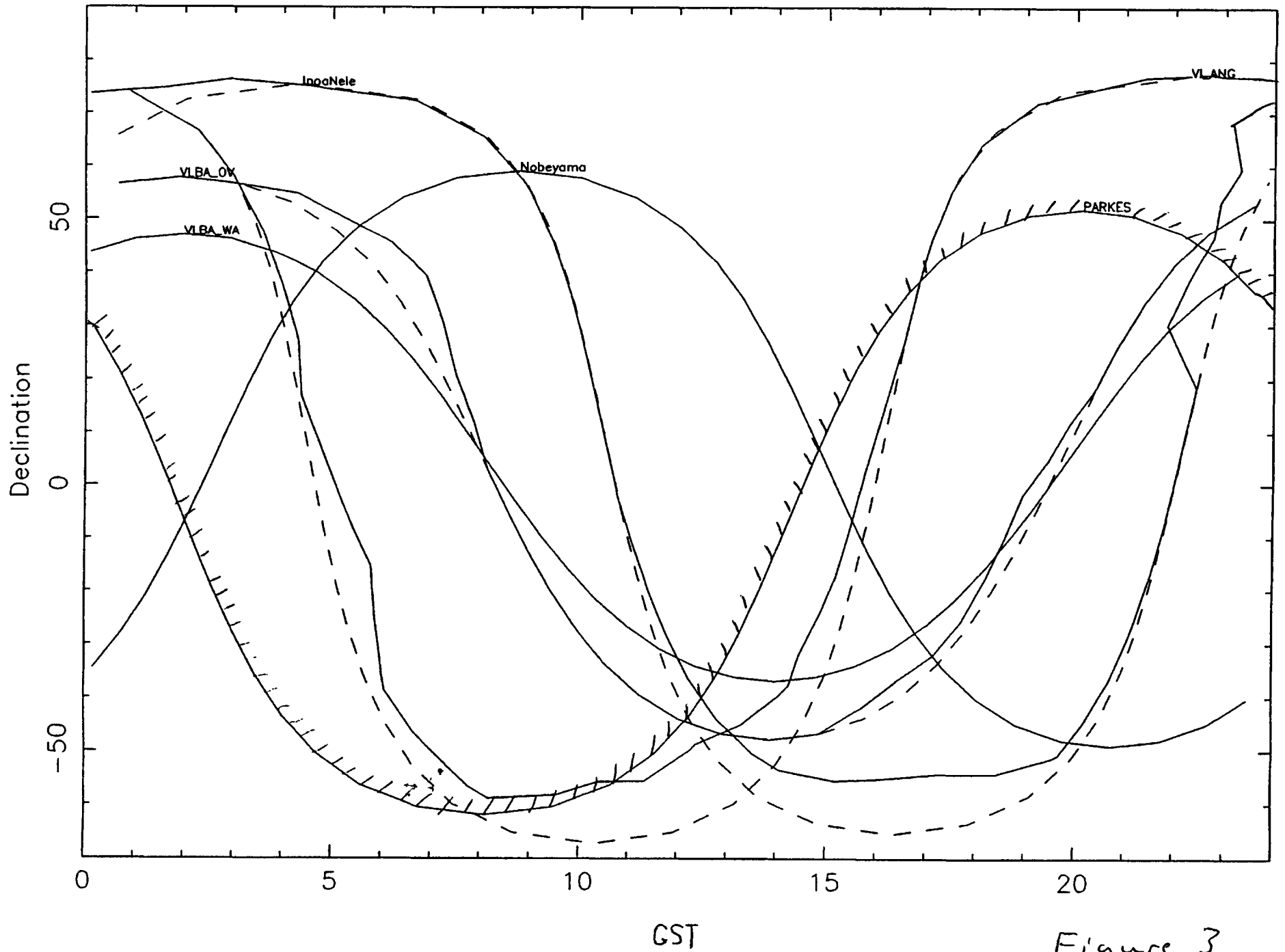


Figure 3