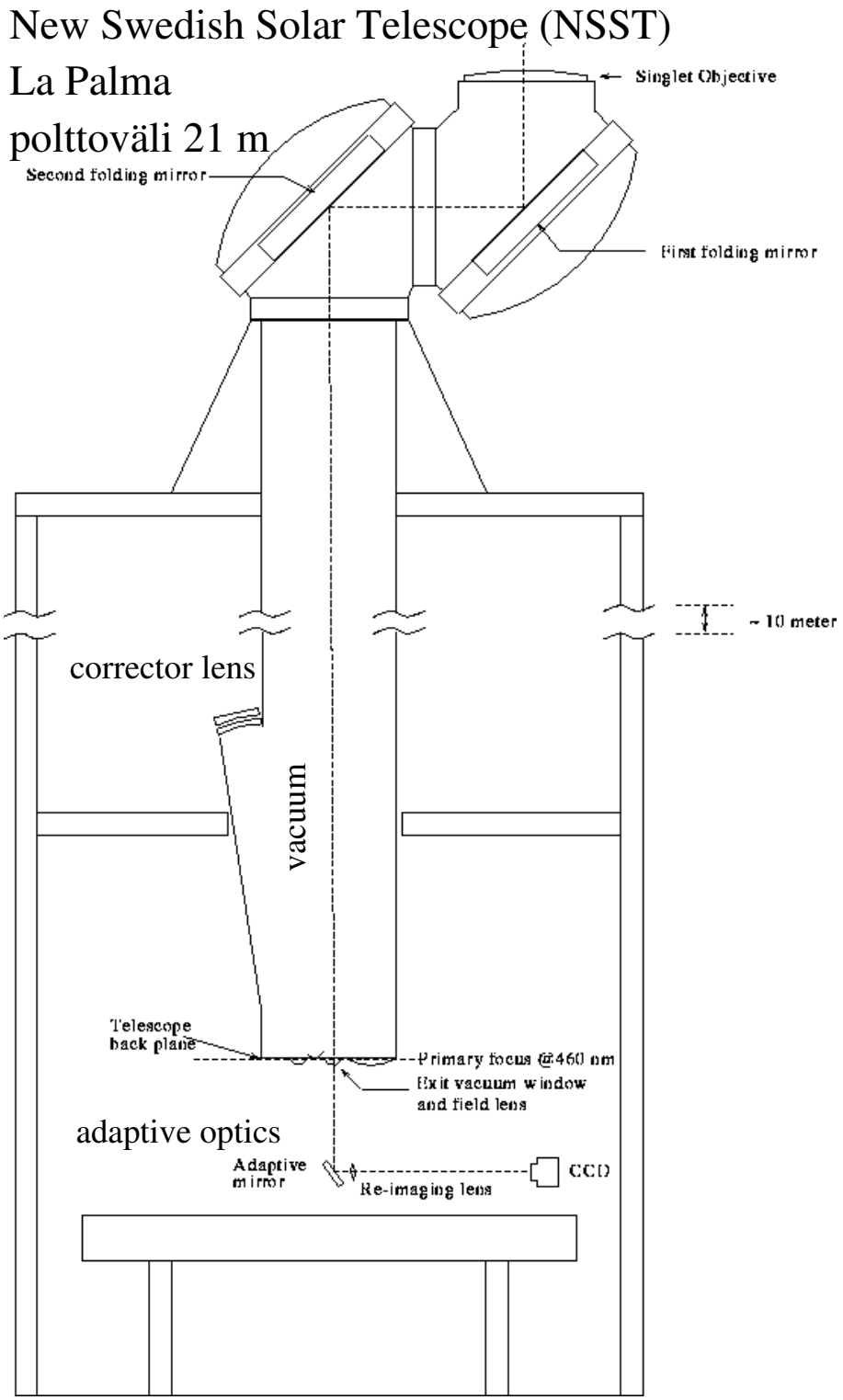
Luku 6

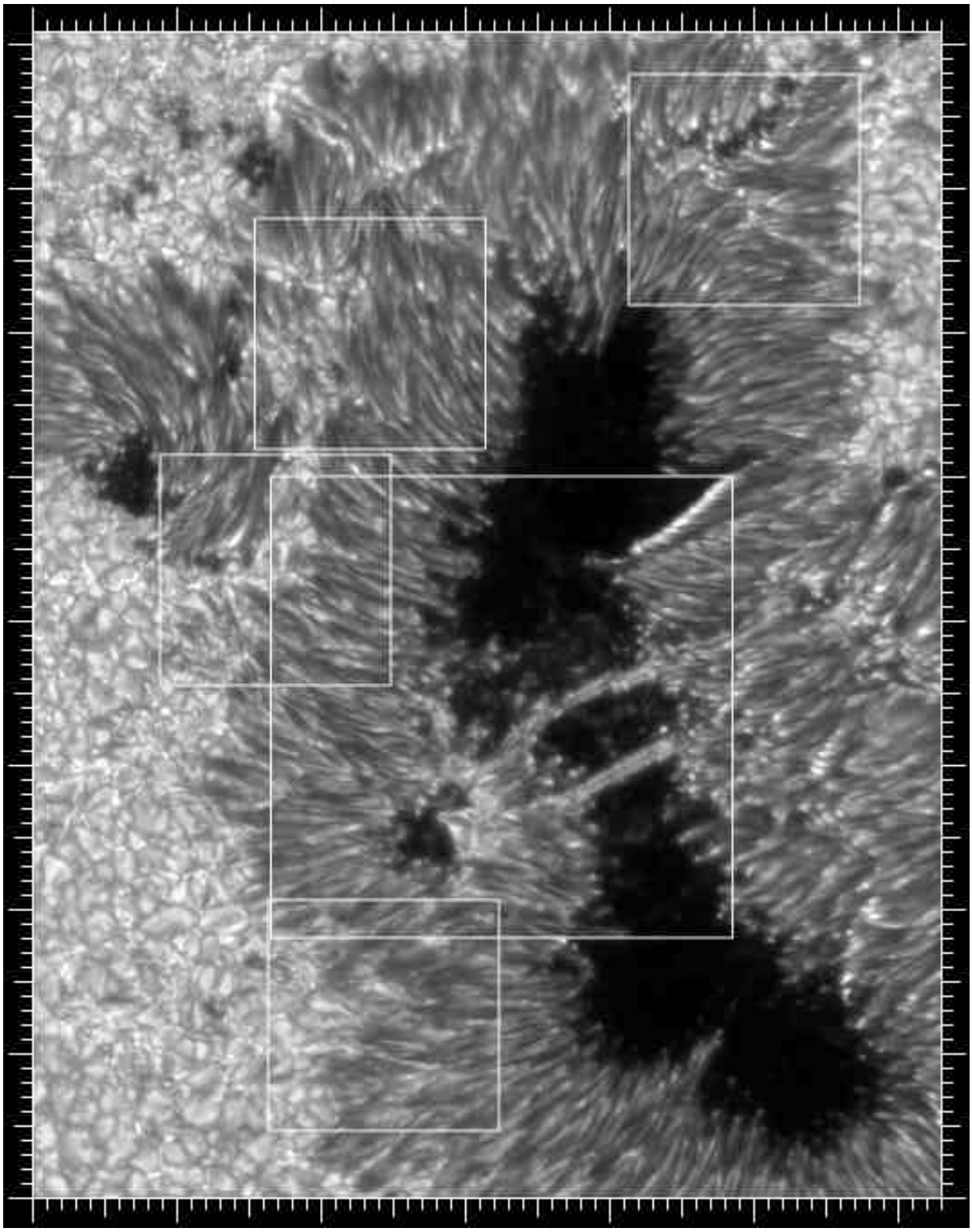
UV-alueen instrumentit ja teleskoopit

Parhaimman erotuskyvyn UV-alueella antaa tätä nykyä ruotsalaisten aurinkoteleskooppi La Palmalla Kanarialla. Kuvanmuodostuksessa käytetään adaptiivista optiikkaa, jonka avulla kumotaan suurin osa ilmakehän aiheuttamista häiriöistä (seeing). Kaukoputken lähes metrinen linssi hiottiin Tuorlassa (Opteon Oy).

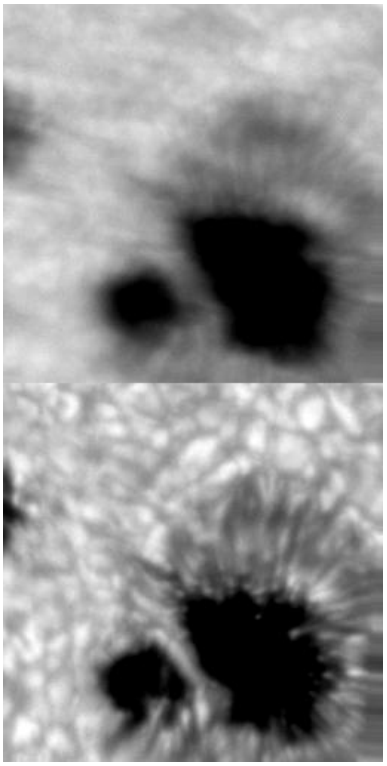
Kuva 6.1: New Swedish Solar Telescope, La Palma. Mirror 97 cm, uses adaptive optics



Kuva 6.2: NSST kaukoputken rakenne.



Kuva 6.3: Auringonpilkku kuvattuna NSST:llä (ks. elokuvia webbisivuilla ja teleskoopin kotisivuilla http://www.astro.su.se/groups/solar/, mm. pari artikkelia Nature-lehdessä)



Kuva 6.4: Adaptiivisen optiikan käyttö auringonpilkkujen kuvauksessa (NSST)

Global High-resolution H-alpha network

The global high-resolution H-alpha (656.3 nm) network utilizes facilities at the Big Bear Solar Observatory (BBSO) in California, the Kanzelhöhe Solar Observatory (KSO) in Austria, the Catania Astrophysical Observatory (CAO) in Italy, Meudon Observatory in France, the Huairou Solar Observing Station (HSOS) and the Yunnan Astronomical Observatory (YNAO) in China.

All these observatories have over 300 sunny days a year, good seeing conditions, adequate observing staffs and well established H-alpha telescope systems. Each of the three stations has a 1K x 1K or 2K x 2K CCD detectors available to monitor the Sun with a spatial resolution of 1 arcsec per pixel. Observations of 1 minute cadence are obtained at each station with higher cadence which can be triggered by automated filament eruption detection. The largest time difference in the network is about 9.4 hours between BBSO and YNAO. The difference between BBSO and KSO is about 8.7 hours and that between YNAO and KSO about 5.9 hours. In summer each station can observe 12 hours on clear days. Therefore, normally there is no night gap in the summer. In winter, when each station is expected to operate 8 hours, the BBSO/YNAO gap will be about 1.6 hours and the BBSO/KSO gab about 0.7 hours. Based on the weather records of the three stations, we anticipate a duty cycle of 70% in summers and of 60% in winters.

While single station high-resolution H-alpha observations can perform important research, for the following reasons it is necessary to monitor the Sun round-the-clock: o The night gap is a severe problem for single station observations. Many important phenomena (e.g. flares and filament/prominent eruptions) could happen during the night gap. The continuous data set certainly will increase the accuracy of the measurements, like e.g. the solar rotation determined from feature tracking. Round-the-clock observations can follow the evolution of active regions which produce flares. Statistical analysis can enhance our knowledge of flare prediction. Uniformly processed continuous data certainly are desirable by users around the world for correlative studies with both ground-based and space observations.

GLOBAL HIGH-RESOLUTION Hα NETWORK

Kuva 6.5: Big Bear - Kanzelhöhe - Catania - Meudon - Yunnan - Huairou High resolution H_α network. Verkon teleskooppien määrä on kasvanut koko ajan, perustajajäsenet 1990-luvun lopulla olivat Big Bear, Kanzelhöhe ja Yunnan.

BIG BEAR SOLAR OBSERVATORY (USA)
BBSO's telescopes are specially designed for solar observations. A single fork mount supports the three main telescopes: a 65 cm reflector, a 25 cm refractor, and a 15 cm refractor. The 15 cm Singer telescope monitors the whole Sun in H-alpha.

KANZELHÖHE SOLAR OBSERVATORY (Austria)
At KSO the H-alpha observations are obtained with one of the three refractors of the monitoring instrument.

CATANIA ASTROPHYSICAL OBSERVATORY (Italy)
H-alpha observations are performed with a 15 cm refractor (focal length 230 cm) mounted on an equatorial spar.

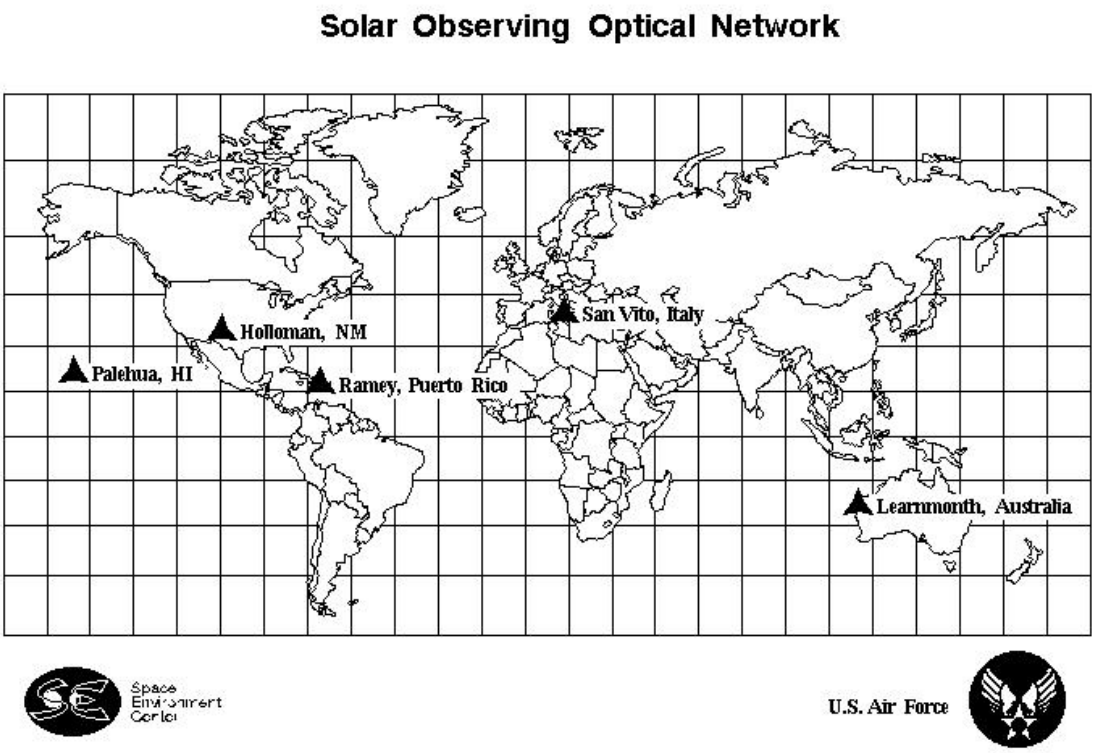
OBSERVATOIRE DE PARIS, SECTION DE MEUDON (France)
The Meudon spectroheliograph is dedicated to full disk solar observations. It sonsists of a coelostat (two flat mirrors of 45 cm); a horizontal refractor (25 cm aperture) and a spectrograph. The full sun is scanned across the slit of the spectrograph during about 1 mn. The profile of the H alpha spectral line are recorded with a spectral resolution of 0.025 nm and the core intensity is used to provide monochromatic images. We also provide a "prominence"image. For that purpose we use a longer exposure time, so that prominences appear more clearly on the solar

limb. In order to avoid overexposure of the solar disk, we put in front of it an artificial moon which consists of a circular neutral density glass (ND 0.8). Other data products: CaII K full disk images.

YUNNAN ASTRONOMICAL OBSERVATORY (China)
The synoptic observations at YNAO are carried out in a solar tower which hosts a twin telescope. Both telescopes have 18 cm aperture and one of them is the full disk H-alpha telescope.

HUAIROU SOLAR OBSERVING STATION (China)
Synoptic observations at HSO include: vector magnetic field and line-of-sight velocity field measurements both in the photosphere and chromosphere; full disk H-alpha observations. The typical cadence for the full disk H-alpha observations is one image every 10 min. However, the cadence can be increased up tp oner image every 3 seconds.

Webbisivuja:
http://www.astro.su.se/groups/solar/solar.html (Swedish telescope, La Palma)
http://www.bbso.njit.edu/Research/Halpha/ (H-alpha Network)
http://www.sel.noaa.gov/solcoord/soonspotaccess.html (SOONSPOT)



Kuva 6.6: SOON observatories (U.S. Airforce), refracting telescopes, 25 cm, vacuum optics. The data can be searched with the SOONSPOT web archive.