Workshop 1

1. The theoretical angular resolution of a single reflecting telescope is given by

$$\theta = \frac{1.2\lambda}{D} \text{ radians}$$

where D is the diameter of the telescope and λ is the operating wavelength. Radians are not a convenient unit for the small angles in astronomy so we use arcseconds. There are 60 arcseconds (") in an arcminute (') and 60 arcminutes in a degree (^{o}). Hence, there are

$$\frac{360}{2\pi} \times 60 \times 60 = 206265 \text{ arcseconds in a radian}$$

Evaluate the theoretical resolution in arcseconds for some well known telescopes that cover a range of different wavelengths.

2. Arrays of more than one telescope can operate together as an interferometer. The resolution is then determined by the separation of the telescopes or baseline, b, rather than the size of the individual telescopes.

$$\theta = \frac{1.2\lambda}{b} \text{ radians}$$

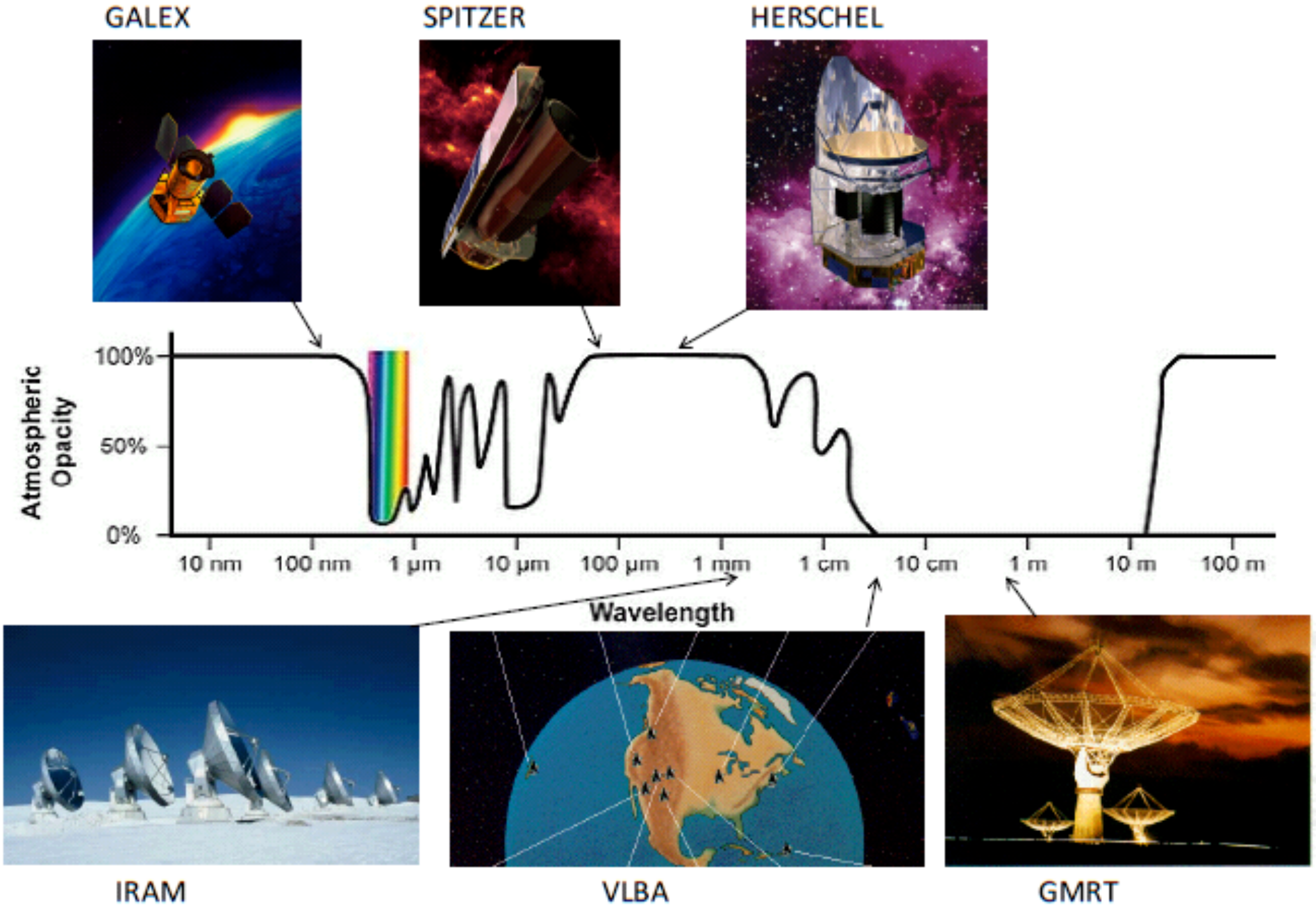
Evaluate the resolution for some arrays of telescopes and compare them to the case in which the telescopes are operating individually.

3. The angular size of an object is given by

$$\theta = \frac{l}{d} \text{ radians} = 206265\frac{l}{d} \text{ arcseconds}$$

where l is the size of the object and d is the distance of the object (and they have to be in the same units). Evaluate the angular sizes in arcseconds of some common objects and compare to the angular resolutions you computed in 2 to find out which telescopes and wavelengths can resolve these objects.

4. From the atmospheric transmission plot which wavebands need to be observed from space? The HST operates in the visible waveband so why is it in space?


GALEX
SPITZER
HERSCHEL
Atmospheric Opacity
100%
50%
0%
10 nm
100 nm
1 µm
10 µm
100 µm
1 mm
1 cm
10 cm
1 m
10 m
100 m
Wavelength
IRAM
VLBA
GMRT