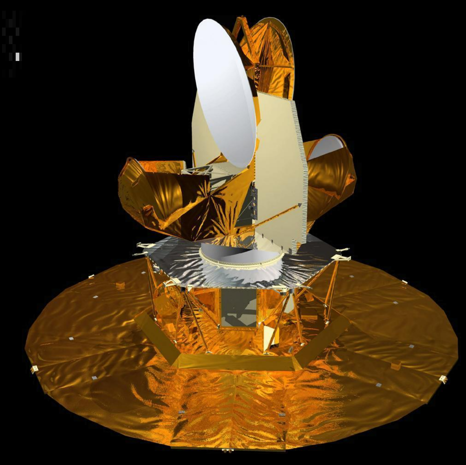
WMAP point sources as space-VLBI calibrators



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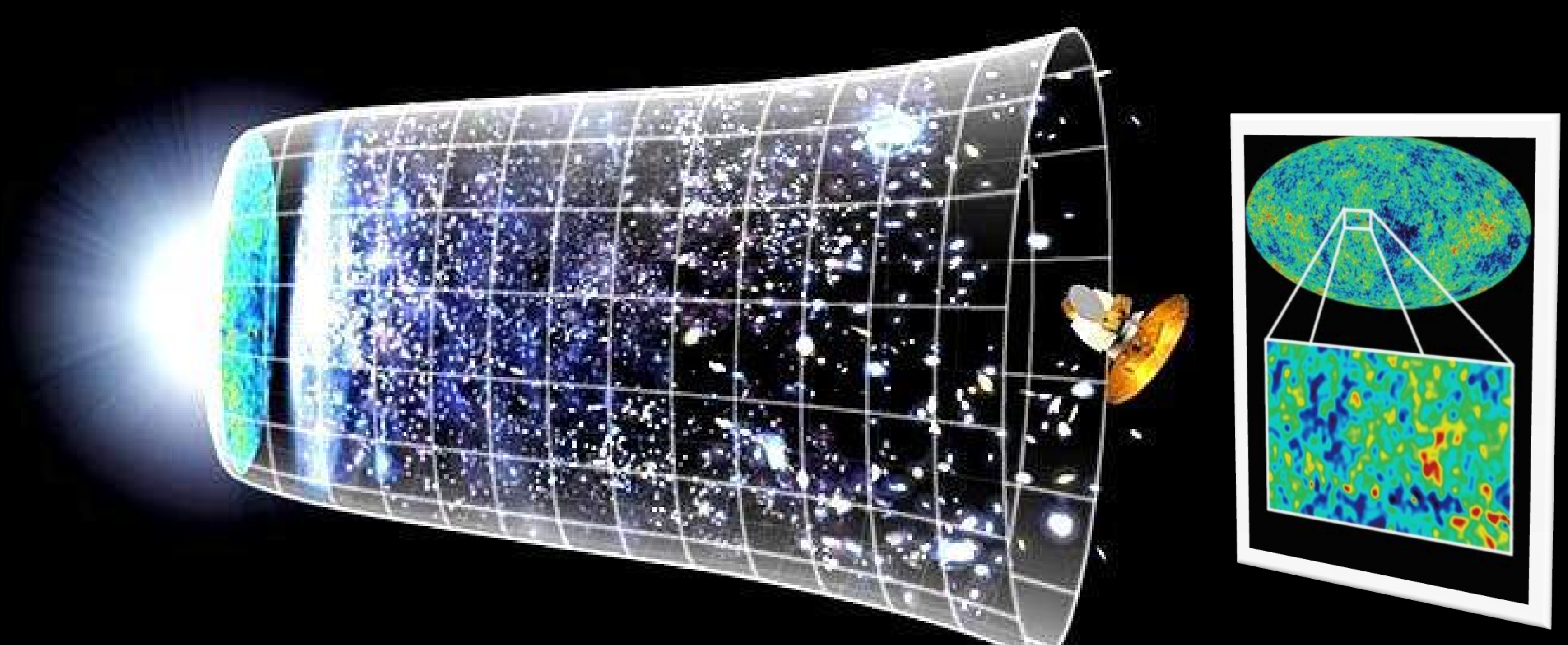
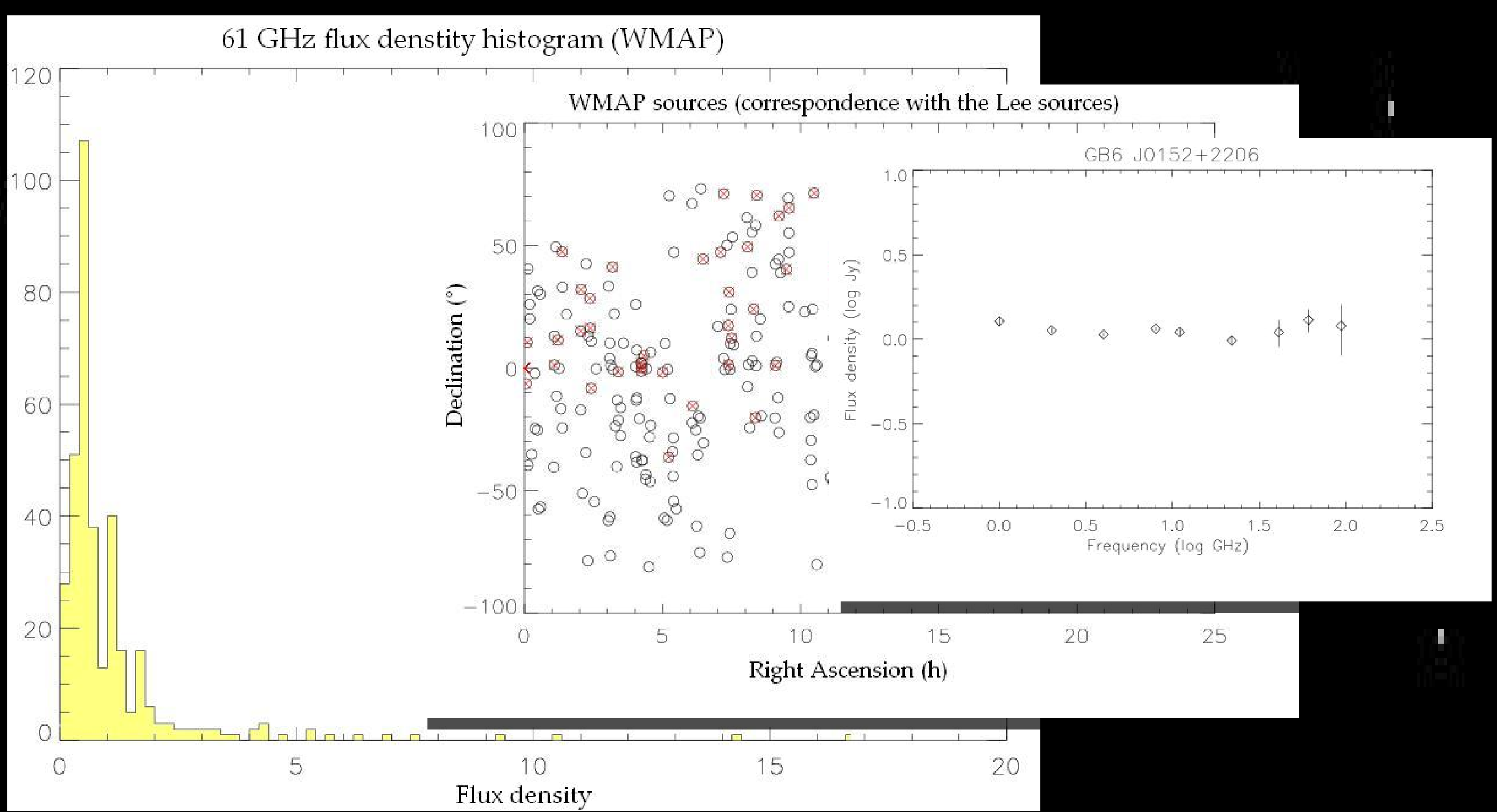
The *Wilkinson Microwave Anisotropy Probe* (WMAP) is a NASA Explorer mission, launched in June 2001 to make fundamental measurements of cosmology. Its main aim is to measure the Cosmic Microwave Background (CMB) temperature anisotropies at five different frequencies between 23 and 94 GHz. The foreground emission – galactic emission, galactic and extragalactic point sources – is a cause of a major concern because it „contaminates" the CMB maps.

In order to separate the CMB data and the foreground emission, an extragalactic point source catalogue was created (Chen & Wright 2009, ApJ 694, 222). This catalogue also offers a great opportunity to study flat-spectrum radio sources in the millimeter wavelength range. Unlike any ground-based instrument, WMAP in fact provides a homogeneous all-sky mm-wavelength survey of the brigthest sources.

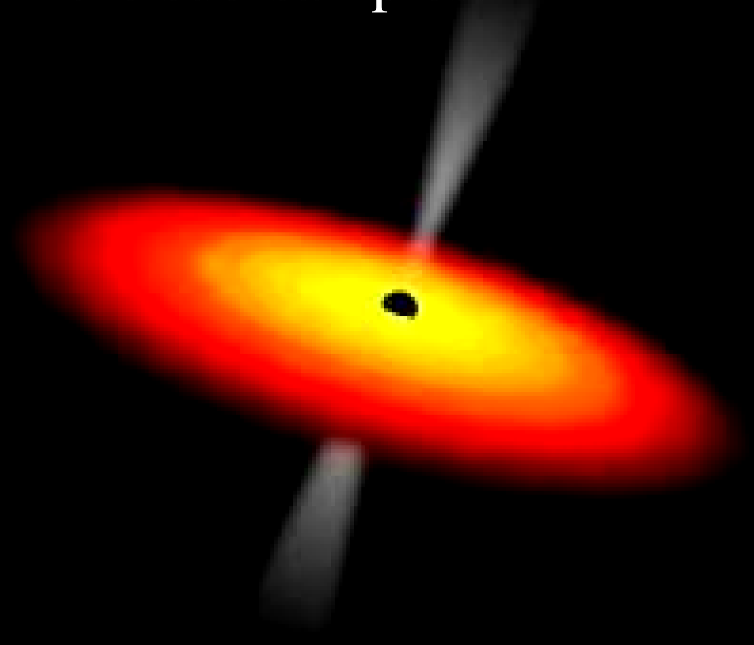




Which quasars are bright and compact enough to be observed with the VLBI technique?

To answer this question, we compared the WMAP list with the existing ground-based Very Long Baseline Interferometry (VLBI) catalogues at high frequencies. We sorted out the sources not observed yet, and created new samples regarding the WMAP sources' appearance in the earlier VLBI catalogues. We also made an overlap with the biggest 86-GHz VLBI catalogue to date (Lee at al. 2008, AJ 136, 159). Using the 41, 61 and 94 GHz WMAP flux densities, we calculated the radio spectral indices, prepared flux density and spectral index histograms for the whole WMAP catalogue and some of the sub-samples.

An important aim of our work was to identify new bright quasars, which will be available for observations in the future at 86 GHz with the VLBI technique. To create such a list, we chose WMAP sources which have not been investigated at 86 GHz before, with flux density at least 1 Jy, and with declination above -40° to have a good radio station coverage (the method was adopted from Lee at al. 2008). To supplement the new catalogue with other data, we searched public databases for optical identifications. We also compiled broad-band radio spectra and collected VLBI images of the sources made at lower frequencies. Our final catalogue consists of 37 radio sources, which would enlarge the list of known mm-VLBI sources by almost 25%. Our sample could easily be extended to lower flux density levels, leading to even more potential mm-VLBI targets.



Targets for the ASTRO-G space-VLBI satellite

ASTRO-G is a planned Japanese space-VLBI satellite, which is expected to be launched in 2013 (Tsuboi et al. 2009, ASPC 402, 30). The satellite will be an extension to the ground-based VLBI system, carrying out observations at 8, 22, 43 GHz frequencies, on interferometric baselines several times longer than the Earth diameter. ASTRO-G will provide higher angular resolution (~38 µas) and better sensitivity than any space-VLBI survey before. It is essential to collect the compact sources available for observations with the ASTRO-G. Importantly, the radio-emitting active galactic nuclei in our new catalogue could also be used as phase-reference calibrators for observing nearby faint radio sources.