Reverberation Mapping:
Trading Time for Spatial Resolution
By Varoujan Gorjian
Reverberation Mapping: Trading Time for Spatial Resolution

Not to scale

Δt

Broad Line Region Clouds

UV-Emmiting Inner Accretion Disk
Reverberation Mapping: Trading Time for Spatial Resolution
Figure 1.1-3. Optical continuum (top) and broad Hβ line emission (bottom) light curve for Mrk 335. The line emission lags the continuum by 13.9 ± 0.9 days. (Grier et al 2012).
Figure 3. Integrated light curves. The continuum flux at 1367Å is in units of $10^{-15} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ Å}^{-1}$ and the line fluxes are in units of $10^{-14} \text{ erg s}^{-1} \text{ cm}^{-2}$ and are in the observed frame. Flux uncertainties include both statistical and systematic errors.
Fig. 2 — Light curves for the intensive monitoring period (HD 2,456,706-2,456,831), going from shortest wavelength (top) to longest (bottom). The band name and central wavelength are given on the left of each panel. Top two panels show the Swift hard and soft X-ray (HX and SX respectively) light curves, in units of c/s. Third panel shows the SST light curve, in units of $10^{-14}$ erg cm$^{-2}$ s$^{-1}$ Å$^{-1}$. Error bars for the light curve are typically ~0.5%, just barely visible in the plot. The bottom six panels show the Swift light curves, again in units of $10^{-14}$ erg cm$^{-2}$ s$^{-1}$ Å$^{-1}$. Dashed gray lines show times PHAD 747.179, 765.722 and 818.999, three local maxima of the SST light curve.
Edelson et al. 2015

Fig. 3 — (a) Interpolated cross-correlation functions for the intensive monitoring period light curves (Figure 2), with all correlations measured relative to the RSP light curve, after removing long term trends (see Section 3). The band name and central wavelength are given on the left of each panel. Note that the interband lag goes from negative to increasingly positive as the band's wavelength increases. Note also that the UV/optical correlations are all strong ($\rho_{\text{max}} = 0.57 - 0.90$) but the X-ray/UV correlations are much weaker ($\rho_{\text{max}} < 0.45$). (b) Cross-correlation contoured histograms derived from the CCFs as discussed in the text. The band name and central wavelength are given on the left of each panel. All distributions except HX appear consistent with a Gaussian.
A  Acquire target galaxy

B  Observe in 2 Bands in UV, optical photometry and spectroscopy ~ once/day over ~100 days

C  Use relative photometry and spectroscopy to provide light curves

D  Deliver best BH masses to date for 10 AGN which help anchor secondary BH mass determinations
Making the most of a single detector

**Figure 1.2-2.** Left: SpEAR’s CMOS detector provides two science fields and guides our precision poining. Right: SpEAR’s large FOV allows for additional ancillary science on M-dwarf variability.
1 Year Mission Operating in LEO Orbit
Ground-based Follow-up Observations
March 2018 Launch Date

2. Slew: Point towards Sun

3. Orbit Day:
   Hold Attitude;
   Charge Batteries

4. Slew: Point to target

5. Orbit Night:
   Observe target galaxy

To date for 10 AGN
Black Hole mass
Solar Orbit: A chain of observatories

Why a Better Choice?

Better Thermal Environment
(allow passive cooling)
No Need for Earth-Moon Avoidance
(Maximizes observing time)
No Earth Radiation Belt
(no damage to detectors or electronics)

... AND easier to get into Earth Trailing than GEO or L2
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