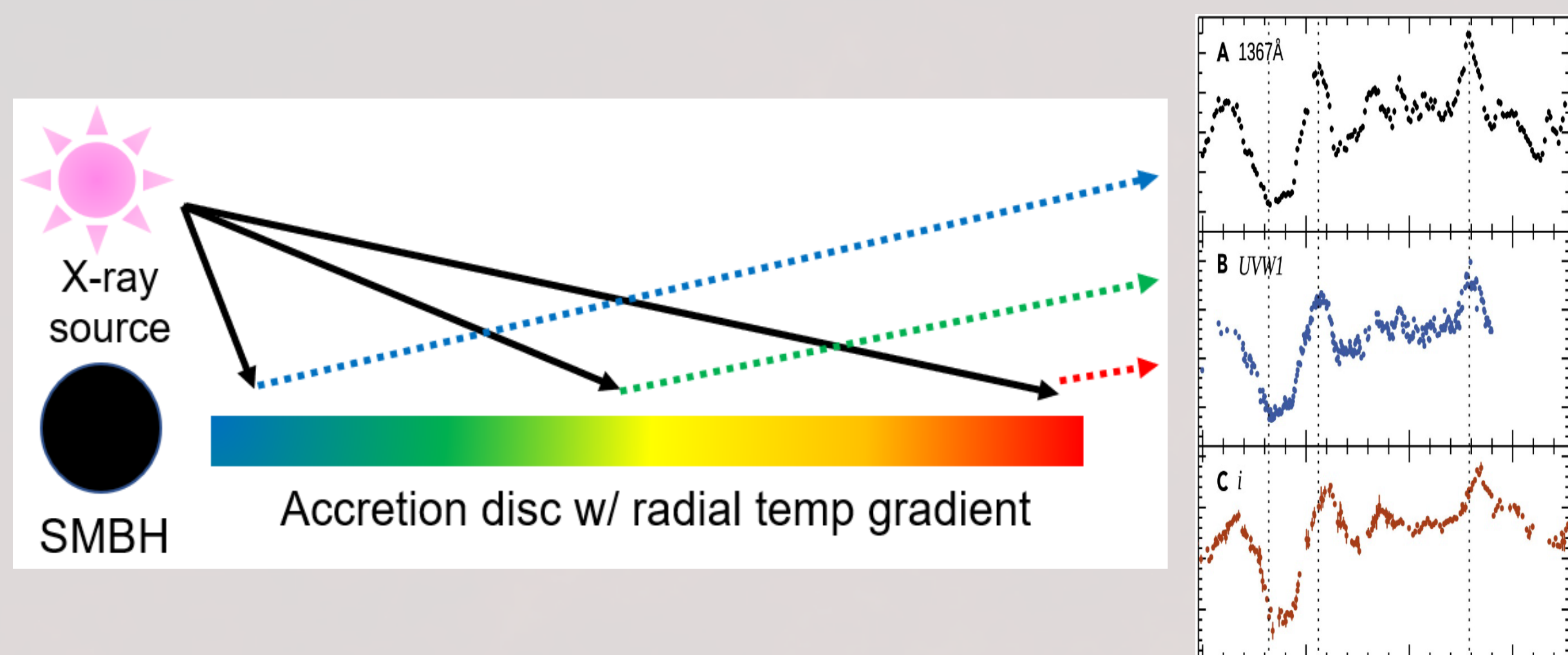


Using AGN lightcurves to map accretion disc temperature fluctuations

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The Lamppost Model of AGNs

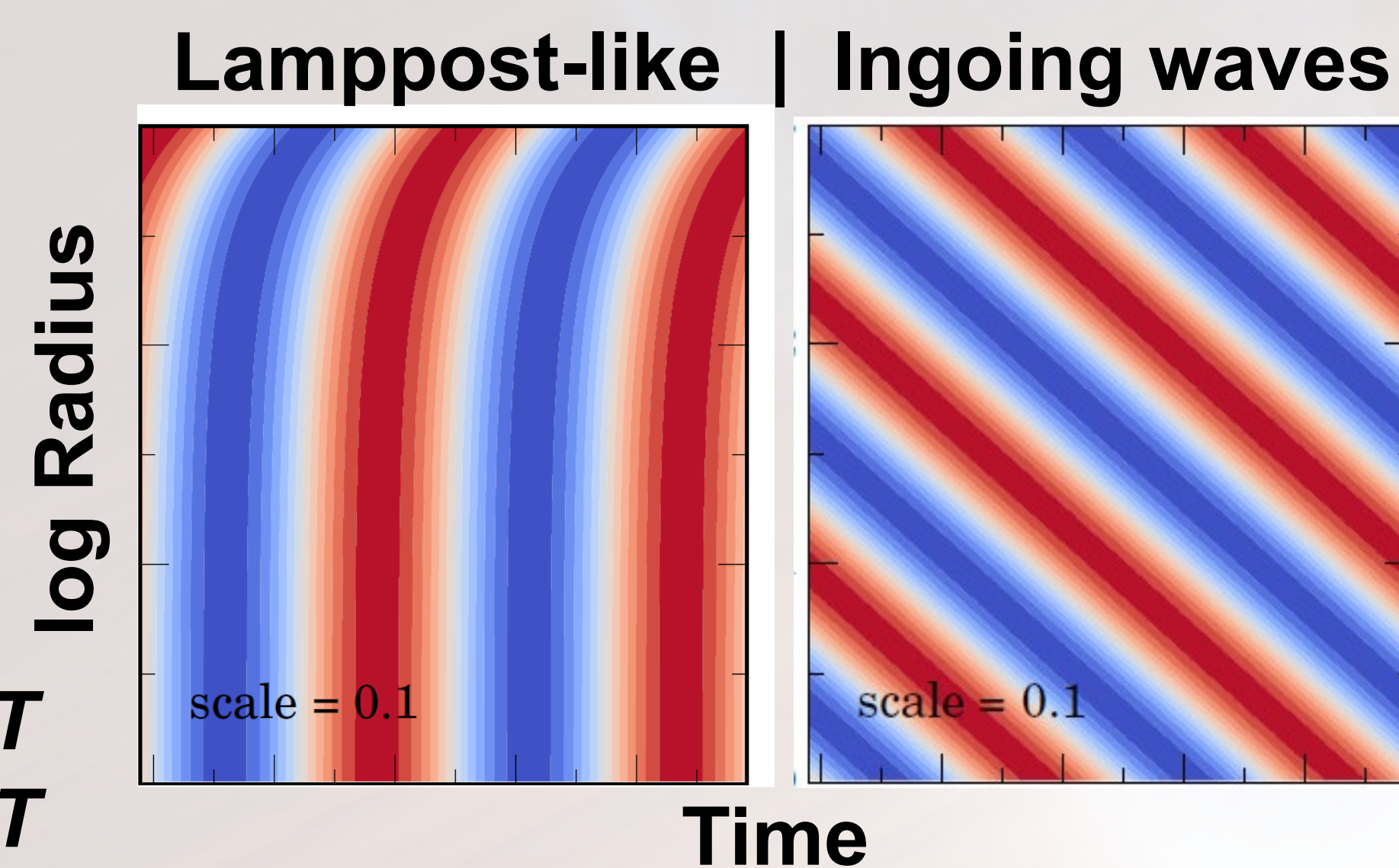


- X-ray “lamppost” illuminates accretion disc, reprocessed into **UV/optical variability**
- Evident in **tight red-lags-blue** correlations between filters
- **Has many issues**, including **variability timescales matching that of disc**, rather than “external” source

Mapping accretion discs in ΔT

- AGN continuum flux changes are due to **thermal fluctuations ΔT** in accretion disc
- **Blue filters** correspond to **inner radii**, **red filters** to **outer radii**
- **Invert lightcurves** to get $\Delta T(t, R)$

Red = $+\Delta T$
Blue = $-\Delta T$

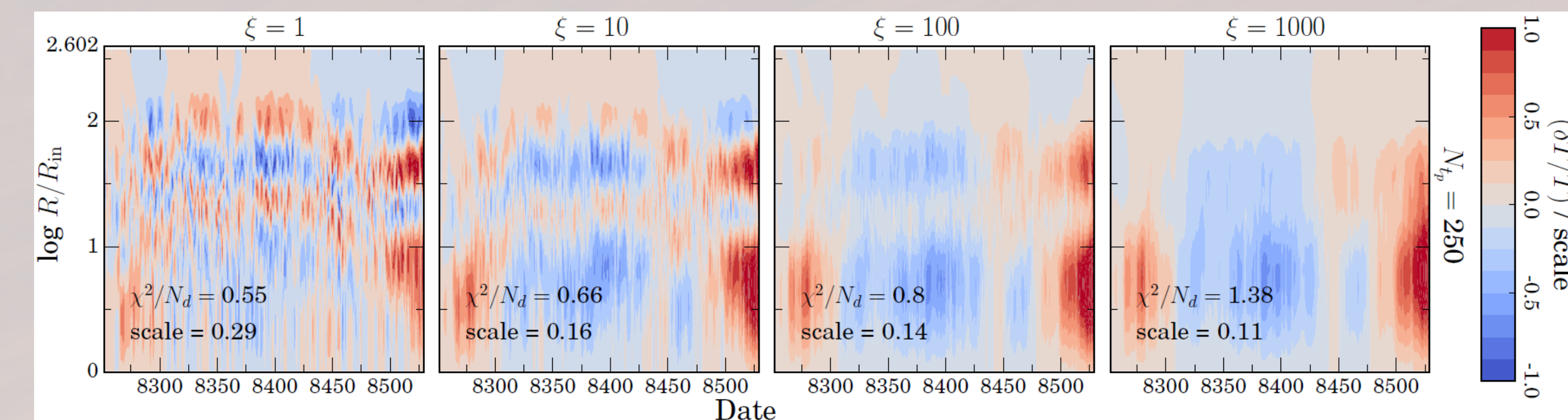


Lightcurves to ΔT maps

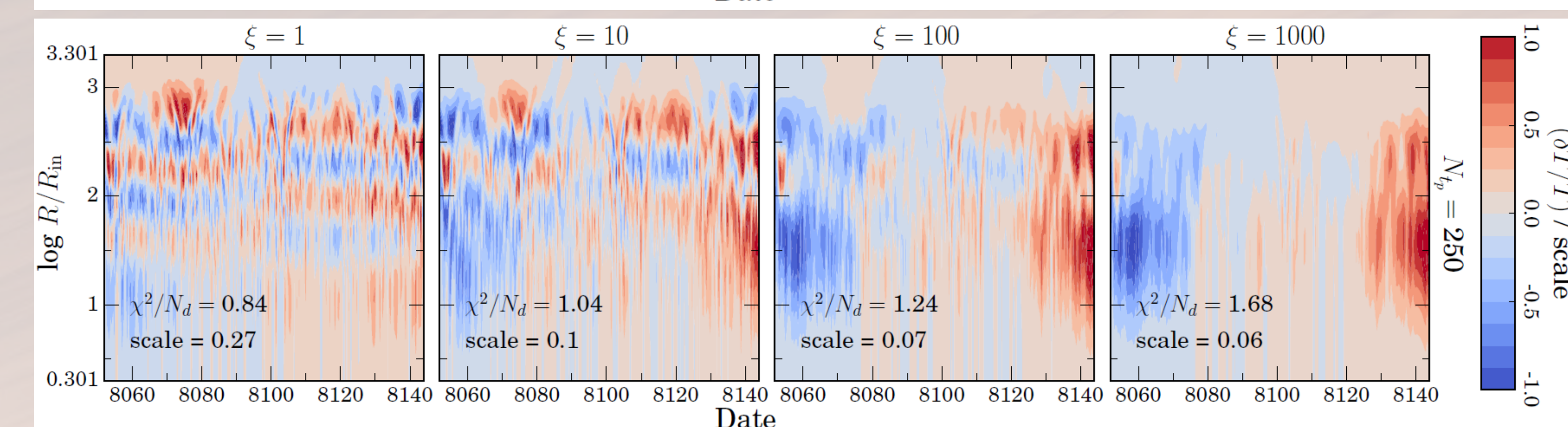
- Inversion is partly **degenerate**; requires **additional constraints**
- ΔT solutions depending on **smoothing param ξ**
- Assume $\Delta T/T$ is small, solution is smooth across radial/time bins

Other AGNs show similar radial structures

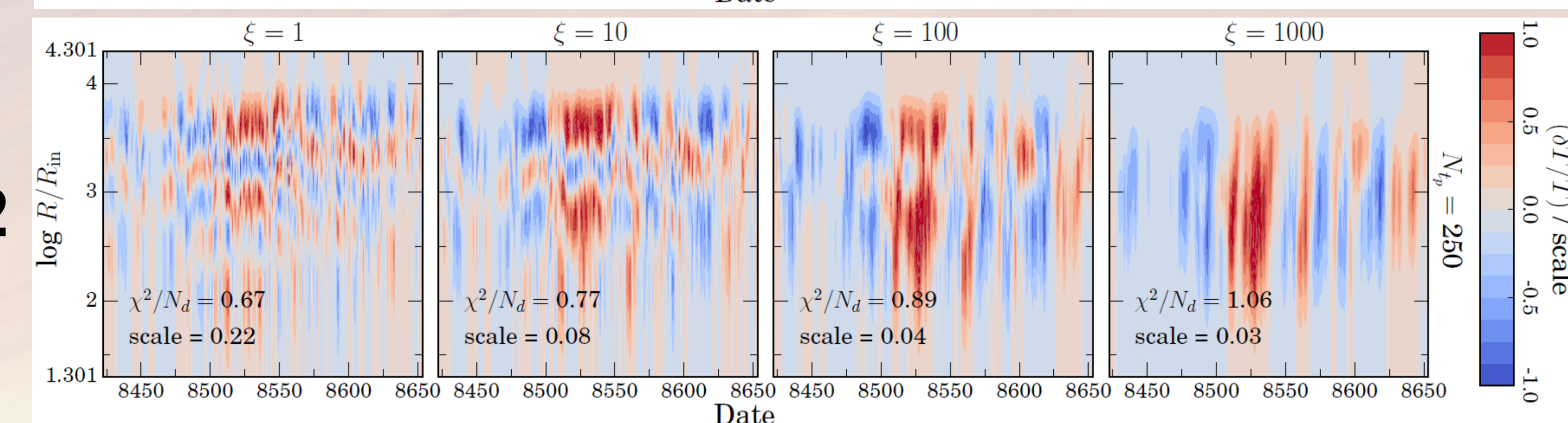
Fairall 9



Mrk 110



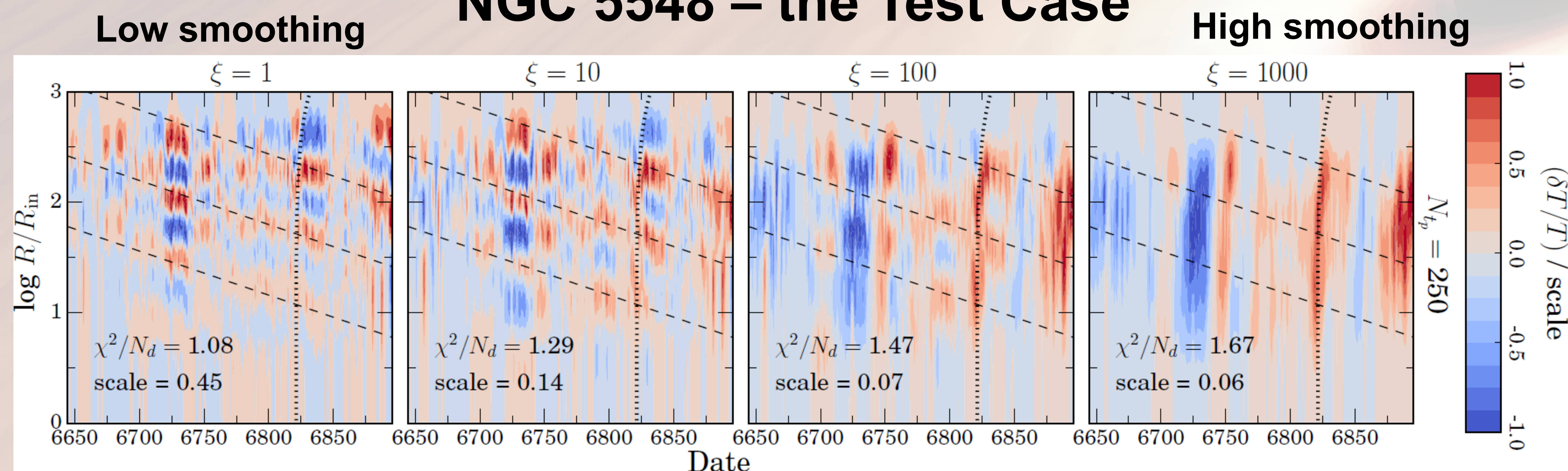
Mrk 142



Lightcurves to ΔT maps

- Inversion is partly **degenerate**; requires **additional constraints**
- ΔT solutions depending on **smoothing param ξ**
- Assume $\Delta T/T$ is small, solution is smooth across radial/time bins

NGC 5548 – the Test Case



- Solutions with reasonable smoothing show **slow ingoing radial structures/waves**
- **Not dominated by lamppost signal** except with very high smoothing

ΔT maps conflict with lamppost model

- ΔT maps dominated by **slow radial structures** not possible in lamppost model; yet **lamppost signal** obviously present in lightcurves
- Possible explanation: **smoothing by blackbody kernel of disc** suppresses slow signals in ΔT more than **fast lamppost signal**
- Possible solution: slow radial structures could generate “**disc-driven lamppost**” resulting in **lamppost signal** with **timescales that match** observed AGN variability

ADS link



Paper details

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