

Highlights of the Stripe 82X Survey: Unveiling the Growth of Supermassive Black Holes Over Cosmic Time

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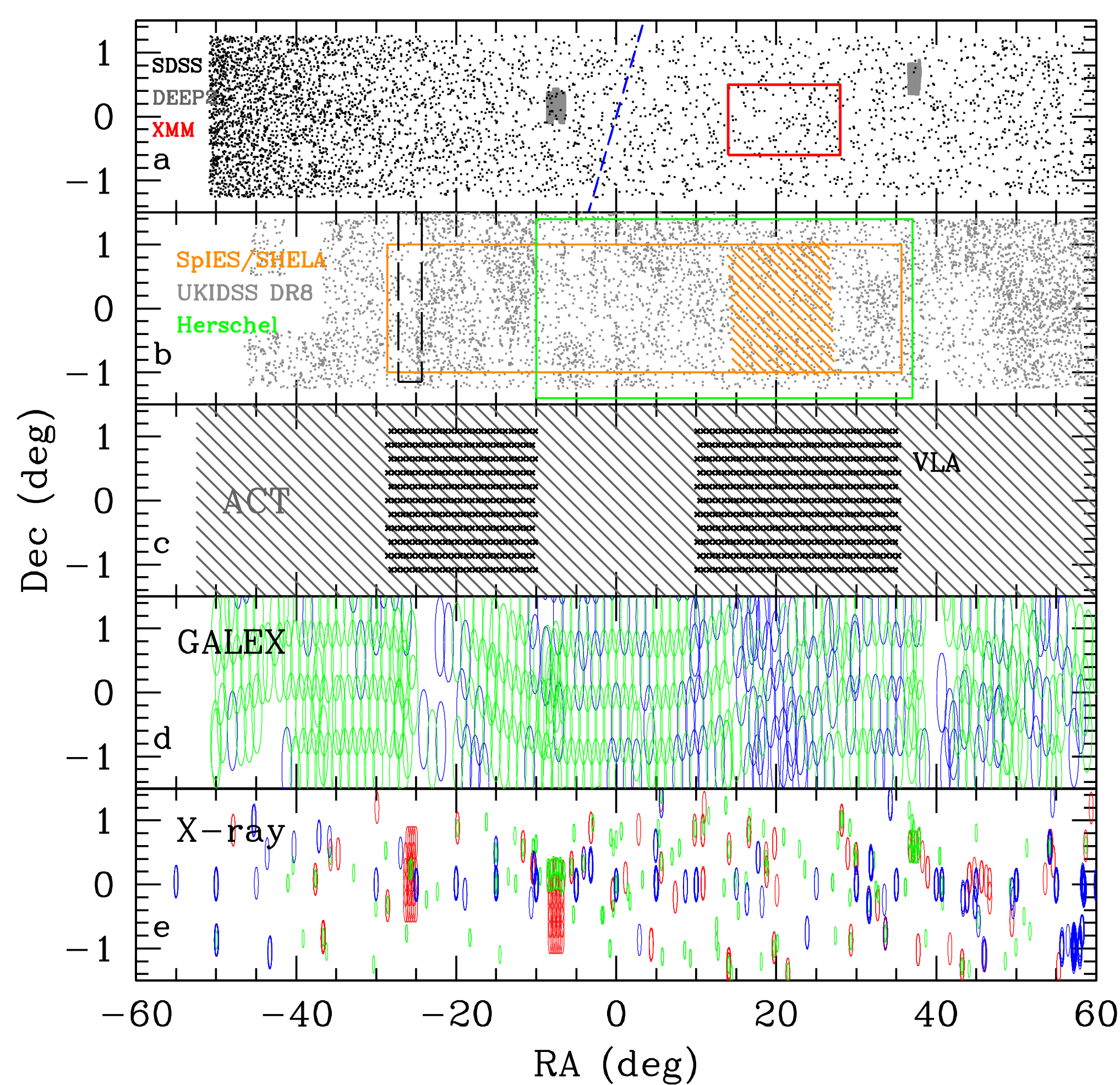
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Introduction

Stripe 82 X is a wide-area X-ray survey overlapping the Sloan Digital Sky Survey (SDSS) Stripe 82 equatorial region.

Why Stripe 82 is an ideal region for an X-ray survey:

- 2 magnitudes deeper imaging than other SDSS areas
- High level of optical spectroscopic completeness : 800 objects/deg²
- Extensive multi-wavelength coverage



X-ray Data

- Archival *Chandra* data (“Stripe 82 ACX”, LaMassa+ 2013a):
 - ~7.4 deg²
 - 1146 X-ray sources
- Archival and proprietary *XMM-Newton* data (LaMassa+ 2013b)
 - ~10.5 deg²
 - 2358 X-ray sources
- **Non-overlapping survey area: 16.5 deg²**
- **+ 17.5 deg² w/ XMM & 2 deg² with Chandra will be added this year:**
 - **First ~6.9 deg² analyzed**
 - **1444 X-ray sources**
- Ultimate goal: 100 deg² X-ray coverage in Stripe 82X

Catalog Matching via Maximum Likelihood Estimator (MLE)

MLE (Sutherland & Saunders 1992) takes into account the distance between X-ray source and ancillary (e.g., optical, infrared) counterpart and the magnitude distribution of ancillary background sources to find “true” matches.

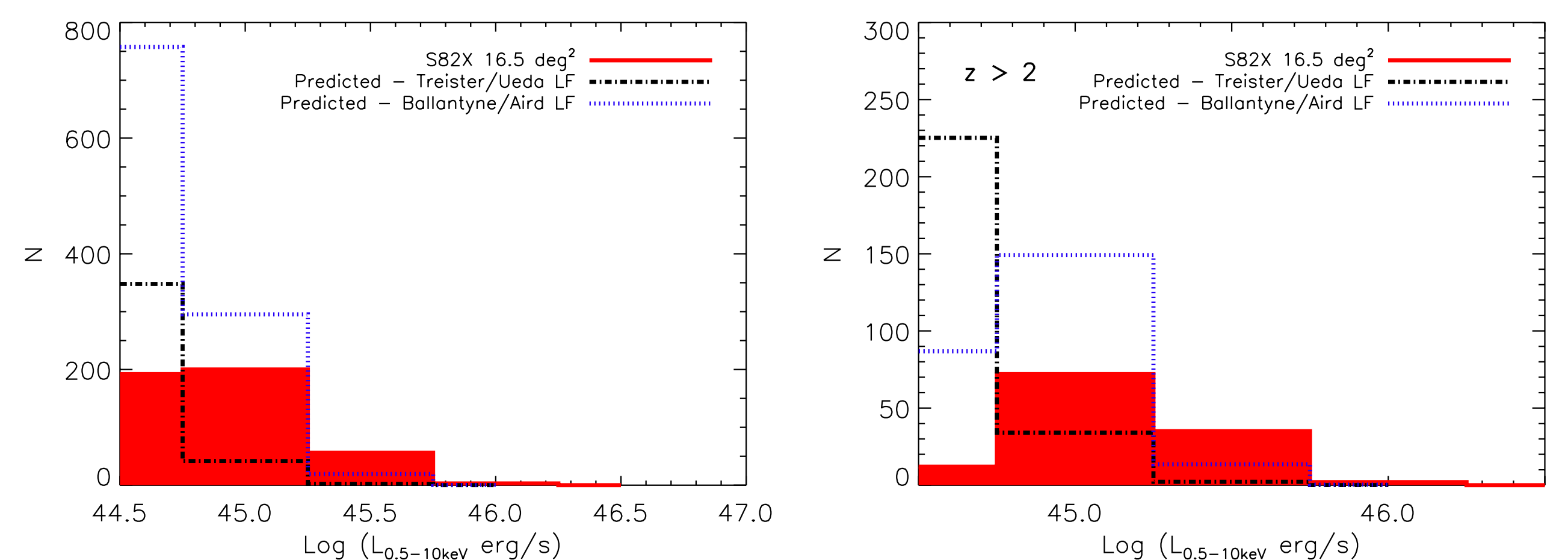
Catalog	Chandra	XMM	Total
X-ray	1146	2358	3362
SDSS	676	1328	1938
WISE	595	1341	1870
UKIDSS	543	1200	1690
GALEX	164	249	396
FIRST	42	82	119
Spec-zs	301	485	74 823

as of 11/14

LaMassa+ 2013b

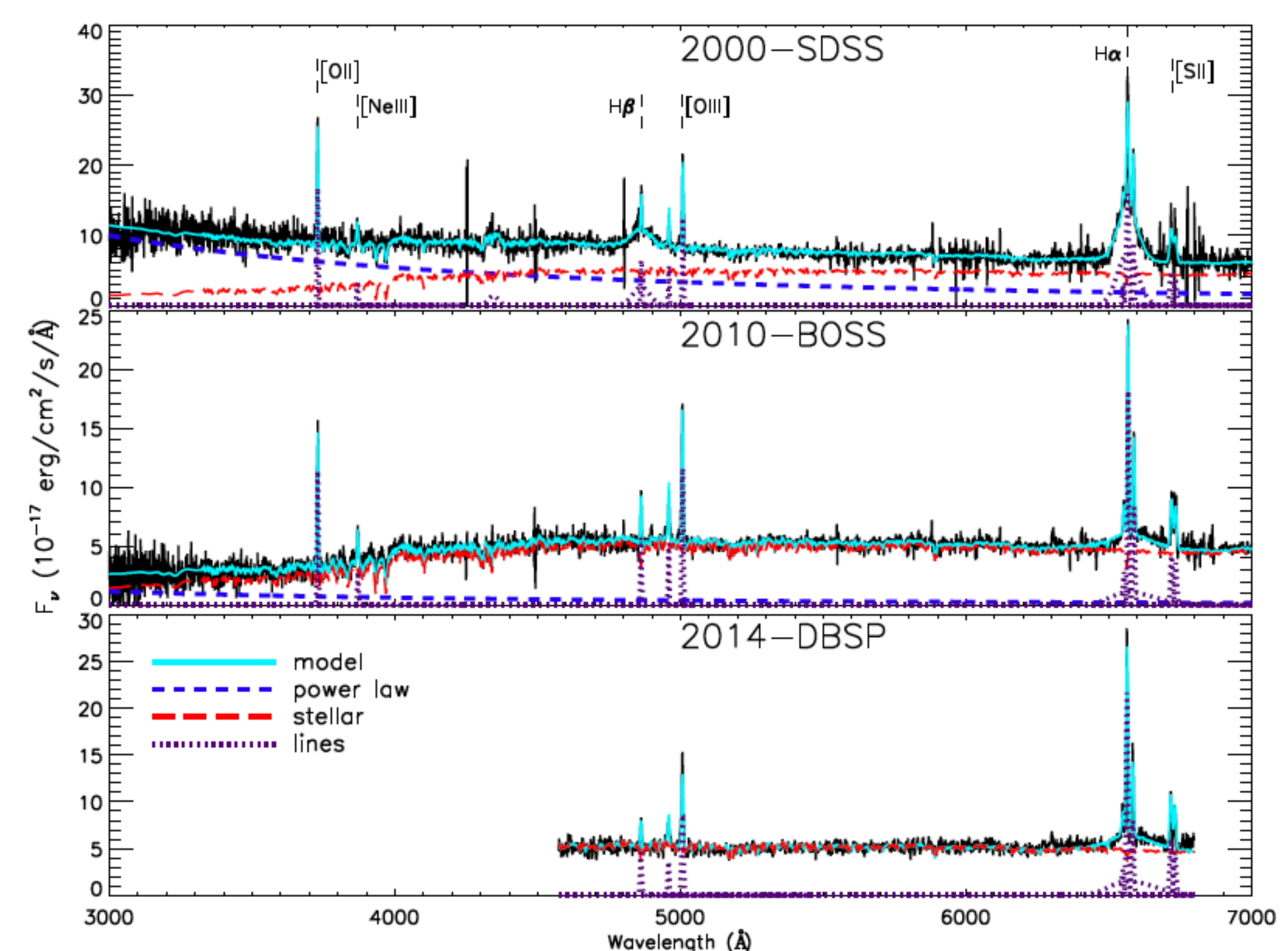
Exciting Stripe 82X Discoveries

More High-Luminosity AGN Detected than Predicted



- Preliminary results from initial 16.5 deg²; additional spectroscopic follow-up will increase red curve at *all luminosities*
- Critically constrains future modeling

1st “Changing-Look” Quasar Discovered in Stripe 82X (LaMassa+ submitted)



- SDSS J015957.64+003310.5 (z = 0.31) transitioned from a Type 1 (broad emission lines) to Type 1.9 (broad component to H α only) in ~9 years
- J0159+0033 is *first quasar* observed to undergo this transition and is *most distant* “changing-look” AGN yet discovered
- X-ray observations detected source both in bright and dim optical states, showing similar flux attenuation, but *lack of absorption signatures*
- **Decrease in AGN ionizing continuum caused spectral transition**
 - Amount of gas in Broad Line Region capable of being ionized by central engine decreased
 - Can be explained via evolutionary paradigm of Elitzur+ (2014): Type 1 \rightarrow 1.2/1.5 \rightarrow 1.8/1.9 \rightarrow 2 in response to decrease in accretion rate
 - Provides insight into intermittency of quasar activity

For more details on Stripe 82X, see LaMassa+ 2013a,b and look for LaMassa+ 2014b within the next couple of weeks to learn more about the 1st changing-look quasar.