

DISCOVERY OF A FAST TRANSIENT OUTFLOW IN NGC 985

JACOBO EBRERO (1), JERRY KRISS (2), AND JELLE KAASTRA (3)

(1) XMM-NEWTON SOC, ESAC; (2) SPACE TELESCOPE SCIENCE INSTITUTE; (3) SRON UTRECHT

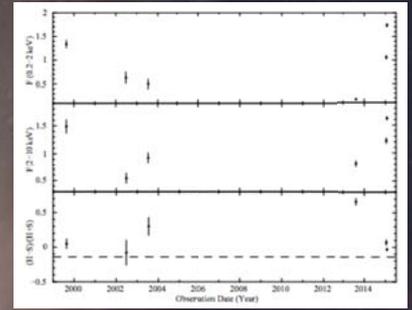
X-RAY FLUX VARIABILITY IN NGC 985

THE SEYFERT 1 GALAXY NGC 985 WAS CAUGHT IN 2013 IN A LOW SOFT X-RAY FLUX STATE (PARKER ET AL. 2014).

NEW XMM-NEWTON OBSERVATIONS IN 2015 SHOWED A SUBSTANTIAL INCREASE IN THE SOFT X-RAY FLUX.

HISTORICAL FLUXES SHOW THAT MOST OF THE VARIABILITY HAPPENS IN THE 0.5-2 KEV BAND, WHILE THE 2-10 KEV FLUXES REMAIN MORE OR LESS CONSTANT.

THE DERIVED HARDNESS RATIOS SUGGEST THAT THE SOURCE HAS UNDERGONE A SERIES OF OBSCURATION EVENTS, THE LAST ONE HAPPENING IN 2013 FROM WHICH NGC 985 HAS JUST EMERGED.



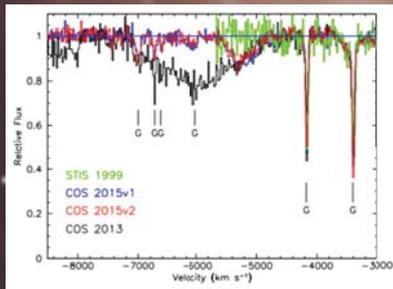
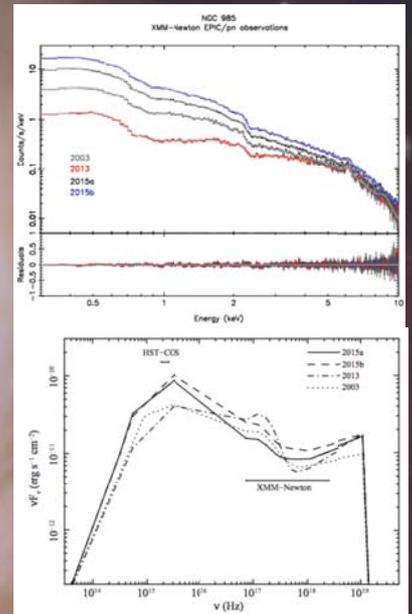
SPECTRAL CHANGES

THE XMM-NEWTON EPIC-PN SPECTRA SHOWS A DEFICIT OF SOFT X-RAY PHOTONS, WHILE THE HARD PART OF THE SPECTRA REMAIN SIMILAR IN ALL EPOCHS. THIS SUGGESTS THAT THE CHANGES SEEN **CAN BE ATTRIBUTED TO OBSCURATION EVENTS** RATHER THAN TO INTRINSIC CHANGES IN THE SOURCE.

WE PERFORMED A SPECTRAL MODELING USING SPEX AND A PHOTIONIZATION BALANCE COMPUTED WITH CLOUDY BASED ON THE SPECTRAL ENERGY DISTRIBUTION (SED) OF NGC 985 IN EACH EPOCH. THE SEDS WERE CONSTRUCTED USING CONTEMPORANEOUS X-RAY (XMM-NEWTON) AND UV (HST-COS) DATA, EXCEPT FOR THE OBSERVATION IN 2003.

THE ANALYSIS SHOWS THE PRESENCE OF AN INTRINSIC IONIZED ABSORBER OUTFLOWING IN THE FORM OF A WIND, AND A MORE NEUTRAL, THICKER OBSCURER WHICH IS CAUSING THE OBSERVED SPECTRAL CHANGES, ALREADY REPORTED IN PARKER ET AL. (2014).

OUR ANALYSIS REVEAL THAT THIS OBSCURATION ALSO HAPPENED MORE THAN ONE DECADE AGO, AND THAT THE SOURCE IS EMERGING NOW FROM THIS OBSCURED STATE BUT NOT ENTIRELY. **THE SPECTRAL CHANGES CAN BE EXPLAINED SOLELY BY THE VARIATIONS OF THE COVERING FRACTION OF THE OBSCURER.** THEY RANGE FROM 85% IN 2003, TO 92% IN 2013, DECREASING TO LESS THAN 20% IN 2015 (EBRERO ET AL. 2016).



CHARACTERIZING THE OBSCURER IN THE UV

THE OBSCURER IS TOO LOWLY IONIZED TO PRODUCE SIGNIFICANT FEATURES IN THE X-RAY BAND.

IT CAN BE TRACKED DOWN IN THE UV, WHERE IT CAUSES A BROAD BLUE-SHIFTED ABSORPTION TROUGH IN THE LY-ALPHA REGION. THE OBSCURER IS OUTFLOWING AT ~ 6000 KM/S AND HAS AN IONIZATION STATE COMPATIBLE WITH WHAT IS SEEN IN THE X-RAYS.

THE COVERING FRACTION OF THE OBSCURER IN THE UV IS LOWER THAN IN THE X-RAYS (21% IN 2013, LESS THAN 2% IN 2015), OWING TO THE LARGER SIZE OF THE UV EMITTING REGION.

CONCLUSIONS AND FUTURE WORK

NGC 985 WAS CAUGHT IN 2013 IN A VERY LOW SOFT X-RAY FLUX, WHICH WAS ATTRIBUTED TO OBSCURATION BY INTERVENING MATERIAL.

RECENT OBSERVATIONS IN 2015 REVEALED THAT THE SOURCE HAS ALMOST EMERGED FROM THIS OBSCURED STATE, BUT NOT ENTIRELY.

ANALYSIS OF ARCHIVAL OBSERVATIONS SUGGEST THAT THIS PHENOMENON MIGHT BE RECURRENT AND COULD HAVE HAPPENED SEVERAL TIMES IN THE LAST DECADE.

ONGOING WORK ANALYZING THE RGS SPECTRA IN THE DIFFERENT EPOCHS SHOWS THAT SOME OF THE IONIZED COMPONENTS CHANGE IN RESPONSE TO VARIATIONS IN THE IONIZING CONTINUUM CAUSED BY THE OBSCURER. THIS WILL BE REPORTED IN A FORTHCOMING PAPER.

REFERENCES:

- EBRERO ET AL., 2016, A&A, 586, 72
- PARKER ET AL., 2014, MNRAS, 445, 1047

