## **Anatomy of the AGN in NGC 5548:** Tracking evolution of the obscuration with Swift

#### Missagh Mehdipour & The NGC 5548 Consortium



The X-ray Universe conference Dublin, 18 June 2014

## Summer 2013 campaign



#### Swift monitoring:

2012	2013	2014
~ every week	~ every 2 days	~ every day

What do we see over a few years with Swift monitoring?

K-RayIUN Obscurer

1. Variability of the underlying X-ray/UV emission

# 2. Evolution of the foreground obscurer

Figure credit: Renaud Person

#### **Examples of X-ray spectral variability in NGC 5548**



#### 2013-2014 Swift lightcurves of NGC 5548



## **Optical-UV-X-ray modelling ingredients**

1) First, produced a model using data <u>before</u> the source became obscured (XMM 2000 & 2001)



## **Optical-UV-X-ray modelling ingredients**

2) Adopted the obscurer + warm absorber model derived from XMM + NuSTAR + INTEGRAL 2013 data



Kaastra et al. (in press)

#### **Optical-UV-X-ray modelling ingredients**

3) Established the optical-UV continuum using HST COS, Swift UVOT and XMM OM data



1100-6900 Å

#### **Relation between the 'soft X-ray excess' and UV**



#### **Relation between the 'soft X-ray excess' and UV**





Energy (keV)

#### Long-term variability of the obscurer & soft X-ray excess



#### Variability of the X-ray obscurer





Figure credit: Renaud Person

X-RayIUN Obscurer

## **Summary**

The X-ray obscurer (stream of outflowing gas near the disk) has been <u>continuously present</u> for a few years.

The obscuring material is constantly being replenished from the accretion disk.

**Changes in obscuration** (covering fraction) produces the observed X-ray hardness ratio variability.

The colder phase (dense clumps) of the obscurer varies on a shorter timescale (days) than its warmer medium (months).

There is a direct link between UV and soft X-ray excess. Soft excess origin: optically thick, warm Comptonisation.