MEETING AGENDA

> **Purpose**

> **People involved**

> **Choose a name**

> **Action list and priorities**

> **Types of sources and events**

> **Some longer term ideas**

> **Next meeting**

GOALS

> **Facilitate the interaction between observers and nuclear physicists / modellers**

> **Offer a uniform/unified repository of M-R or M-Λ constraints from NS and NS-NS mergers**

> **Stay as close as possible to the astrophysical data, free of EOS pre-modelling**

> **Offer easy conversions from the different type of inputs (MCMC samples, posteriors, …)**

> **In the long term, encourage the observer community to provide their full posteriors**

PEOPLE INVOLVED

Present

Excused

- **Collin Capano**
- *Debarati Chatterjee*
- *Thankful Cromartie*
- *Bruno Giacomazzo*
- **Sebastien Guillot**
- **Jérôme Margueron**
- **Melissa Mendes**
- *Cole Miller*

- **Joonas Nättilä**
- *Geert Raaijmakers*
- *Jocelyn Read*
- **Tuomo Salmi**
- **Ingo Tews**
- **David Tsang**
- **Serana Vinciguerra**
- *Anna Watts*

CHOOSE A NAME

> **CompARE** – as a reference to CompOSE

> **NSDB**

> **Neutron Tsars**

> **CompDAT**

> **CompROMAT**

ACTION LIST (SET PRIORITIES)

> **(1) Gather source/event list and constraints**
> > ○ **Collect caveats, assumptions, model dependencies**
> **Define all database entries**
> **Define possible input formats**
> **Define tools provided**
> ○ **Make all script open access**
> **Choose location of repository (eg. Github)**
> **Define the scope of a manual / paper**

TYPES OF SOURCES / EVENTS

1. Fastest NS (ONLY 1)

2. Most massive NSs (above threshold?)

3. NS-NS mergers (possibly confirmed with EM counterpart)

4. MSP with lightcurve modelling

5. Quiescent LMXBs (spectral analysis)

6. Type I X-ray bursts (touchdown, cooling tail, or direct spectral ???)

7. Cooling of accretion NS

1. THE FASTEST NEUTRON STAR

> **Only the fastest is provided**

> **PSR J1748−2446ad in Terzan 5:**
>   - **Period = 0.00139595482(6) sec**

> **Caveat:**
>   - **Conversion to M-R has uncertainties (Haensel et al. 2009)**

> **Model dependencies**
>   - **Timing model (minimal impact on M-R)**
>   - **Assumes uniform rotation**
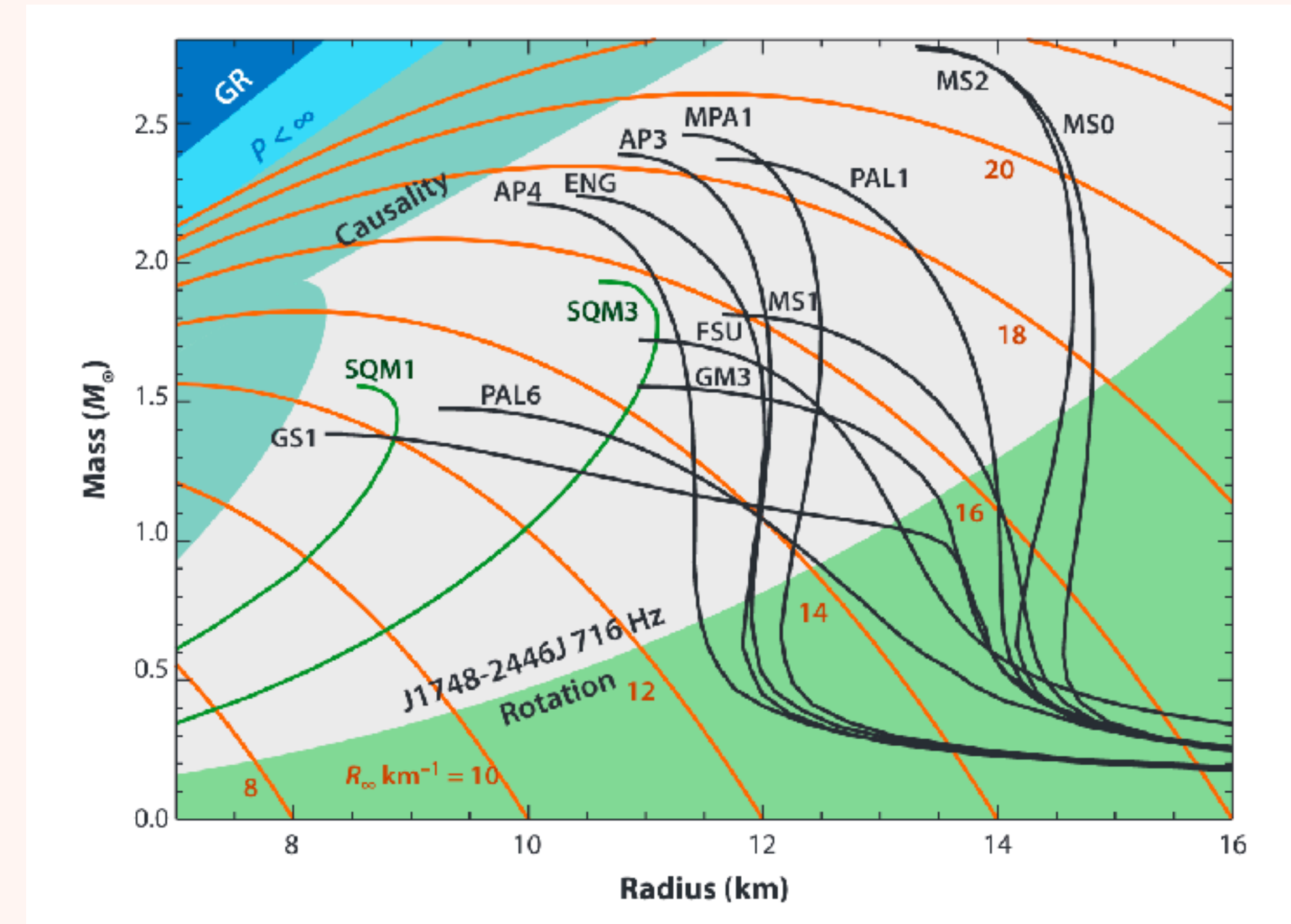
2. THE MOST MASSIVE NEUTRON STAR

➤ **The few most massive above threshold**

➤ **Make list of massive pulsars:**
- ○ **Either all above 1.908 or all pulsars masses**

➤ **To be conservative:**
- ○ **Measurements from radio timing only (no other model dependencies)**

➤ **Model dependencies**
- ○ **General Relativity**
- ○ **Timing model (DM variation, red noise model, ...)**
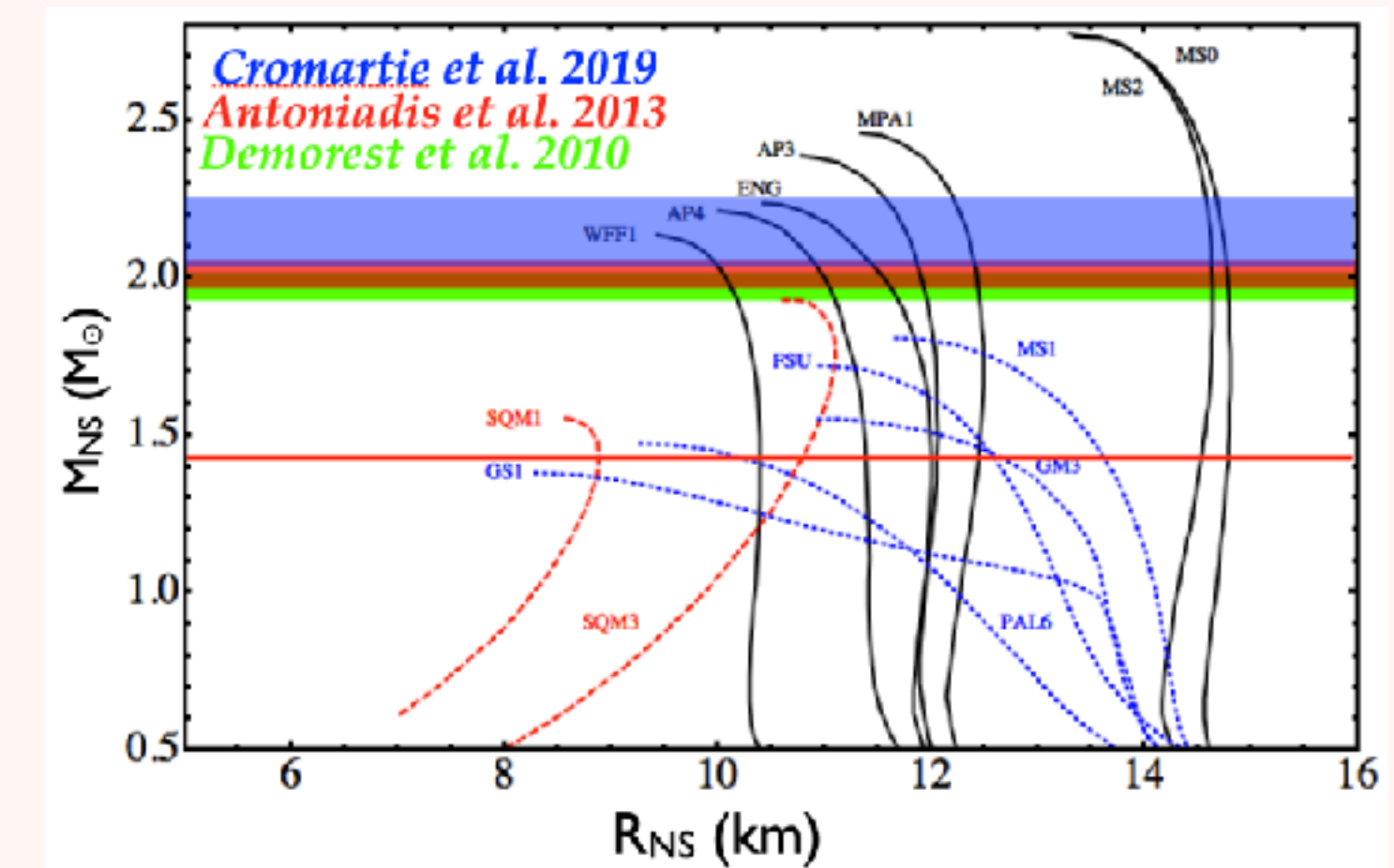
3. GW FROM NS-NS MERGERS

- Confirmed NS if Λ precise enough or those with EM counterpart
- No NS-BH mergers unless confirmed ?
- Be clear about the assumptions taken
  - Different set of constraints for the same event under different assumptions
  - We could provide constraints data with 2 levels (1 level with as little assumptions M-Lambda, and 1 level for M-R constraints under some EOS models.
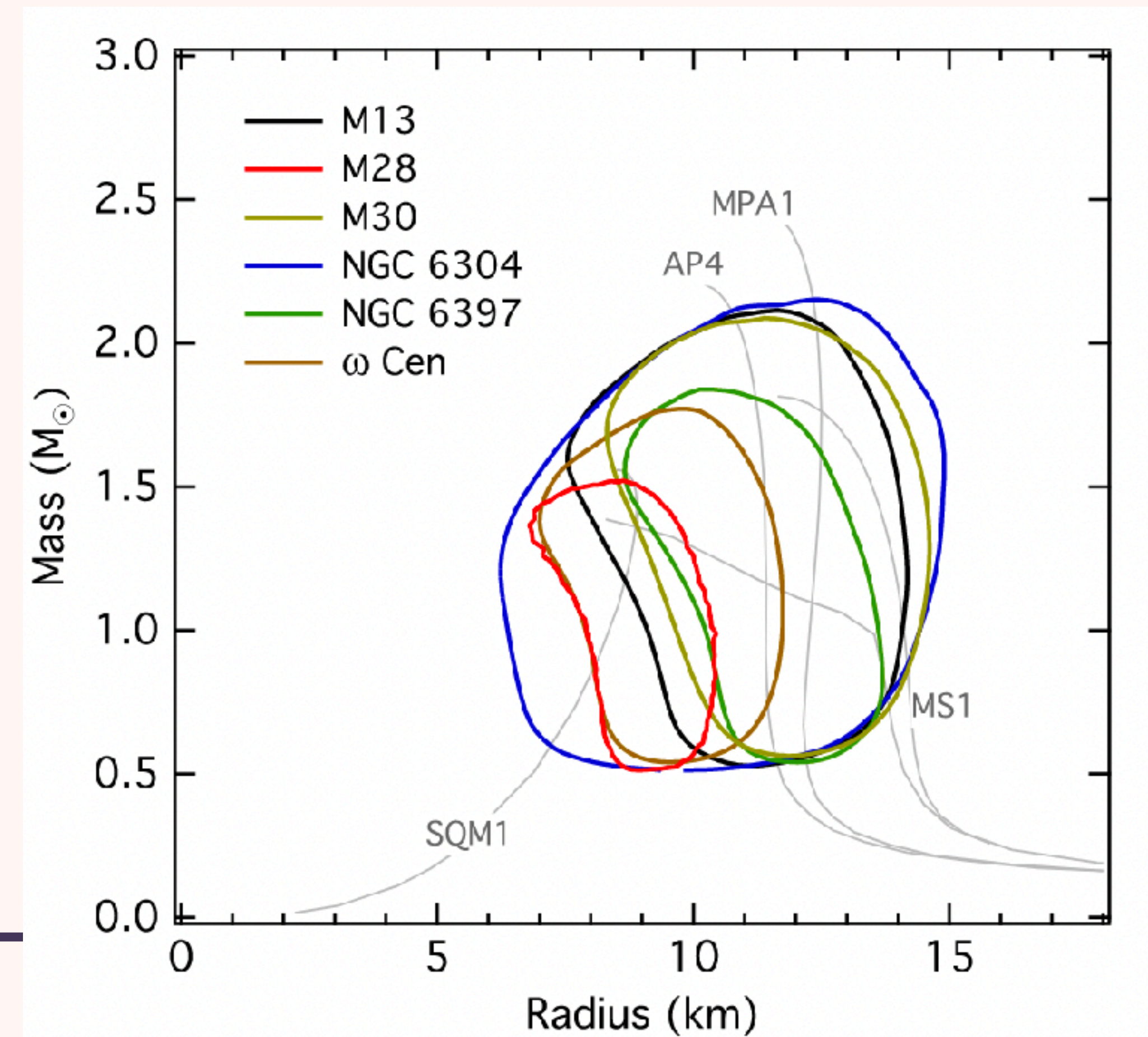- Model dependencies
  - GR
  - ???
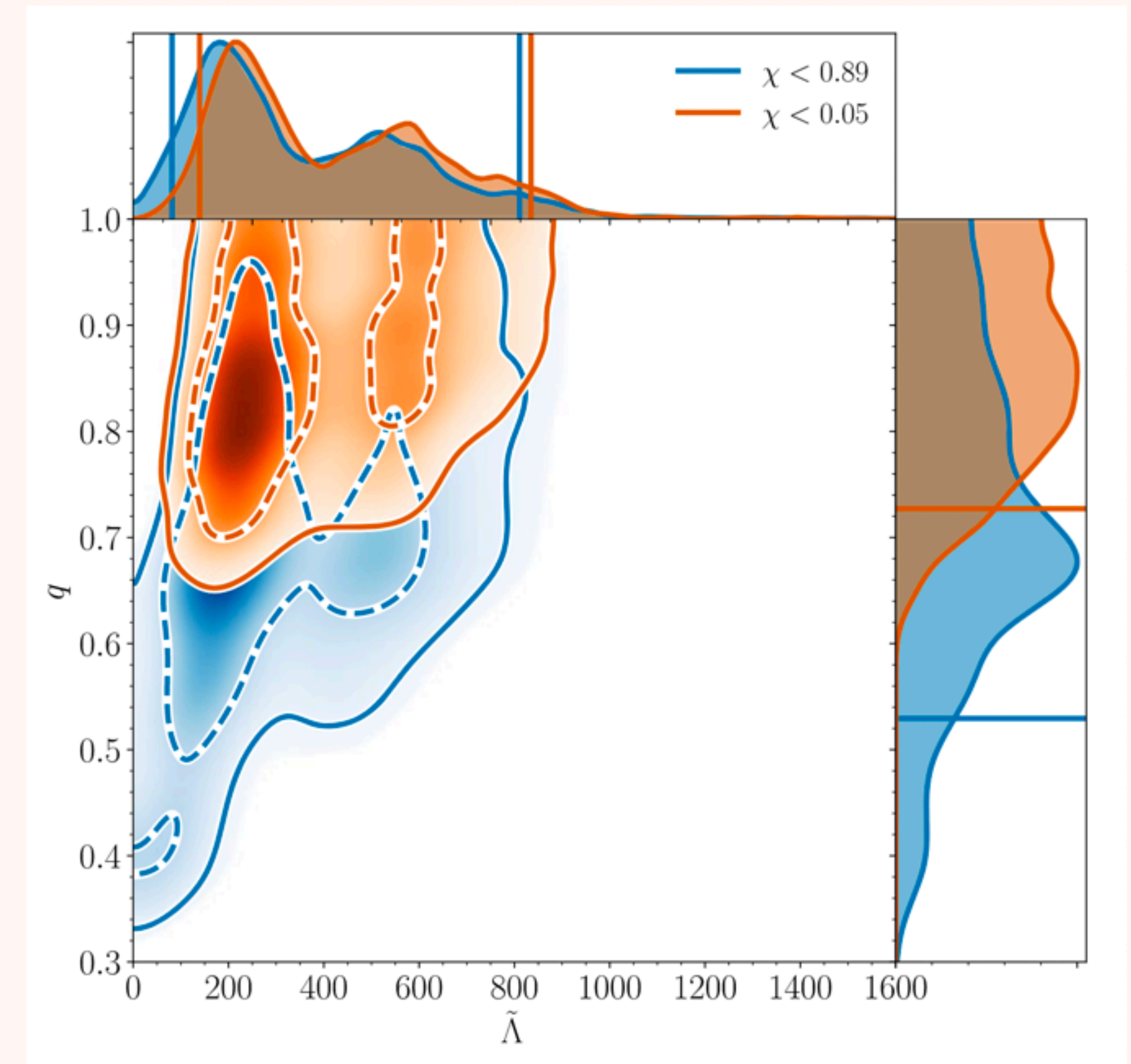
4. PULSE PROFILE MODELLING OF MSP

> **How to deal with multiple M-R constraint per MSP**
> - **Which surface pattern ?**
>   - **For ex.: 1 default constraint set, and additional sets with Bayes factors)**
> - **NICER team subgroup ?**
>   - **Provide both being clear about differences**

> **We will need help from the observers to provide the multiple data set**
> - **But we want to avoid having too many data sets for a single source**

> **Assumptions:**
> - **Atmospheric composition**
> - **Low-B field**

> **Model dependencies**
> - **Surface pattern geometry**
> - **Atmosphere model**
> - **ISM absorption model**
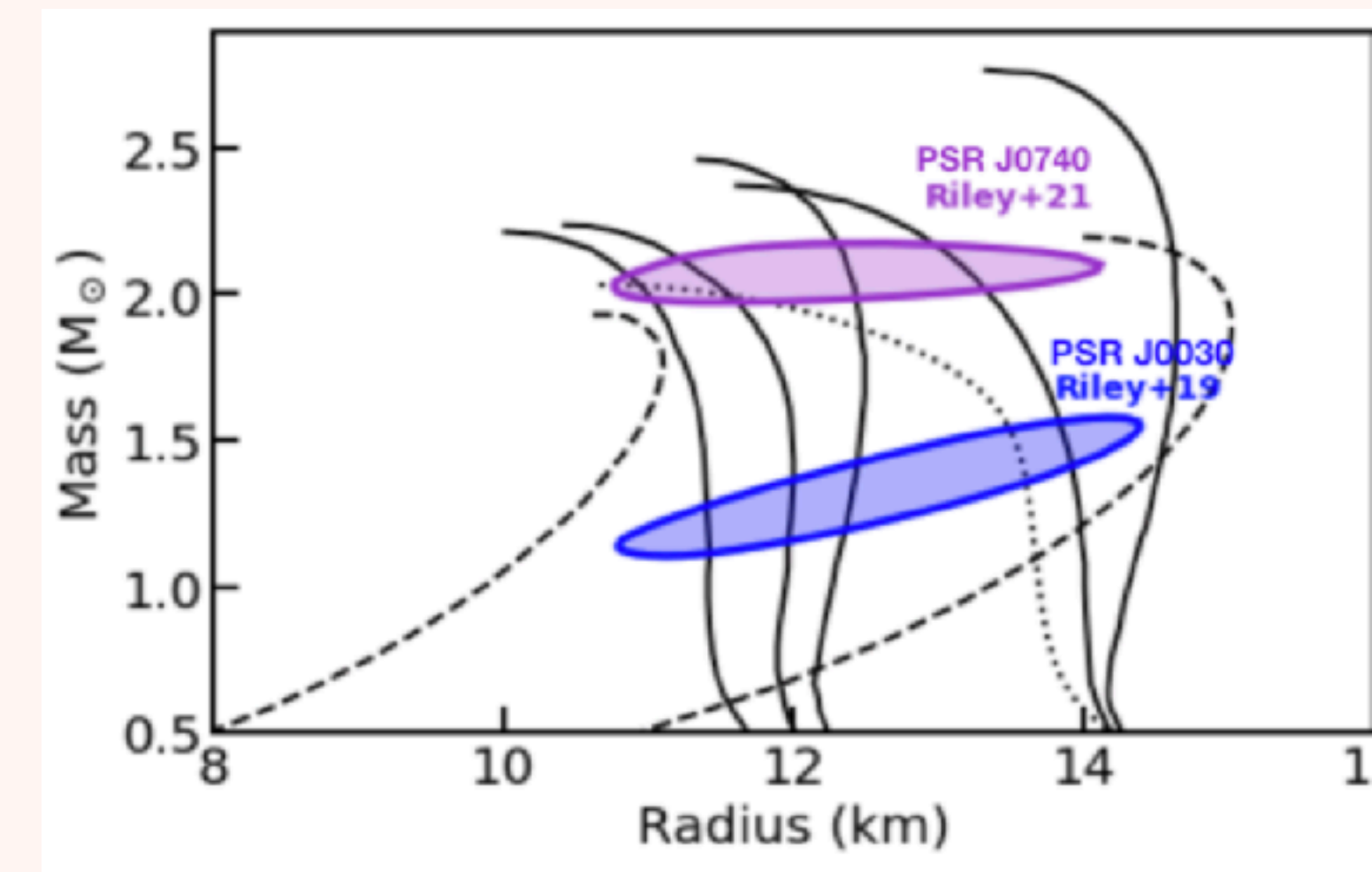
5. QUIESCENT LMXBS

> **Only one M-R constraint per source**
> ○ **From which publication ?**

> **Assumptions:**
> ○ **Atmospheric composition**
> ○ **Low-B field**
> ○ **Isotropic surface emission**
> ○ **Slow rotation**
> ○ **Distance**

> **Model dependencies**
> ○ **Atmosphere model**
> ○ **ISM absorption model**

6. TYPE I X-RAY BURSTS

> **Only one M-R constraint per source**
>> ○ **From which method (touchdown, direct spectral analysis, cooling tail ?)**
> **Assumptions:**
>> ○ **Atmospheric composition**
>> ○ **Distance**
> **Model dependencies**
>> ○ **Atmosphere model?**
>> ○ **ISM absorption model?**
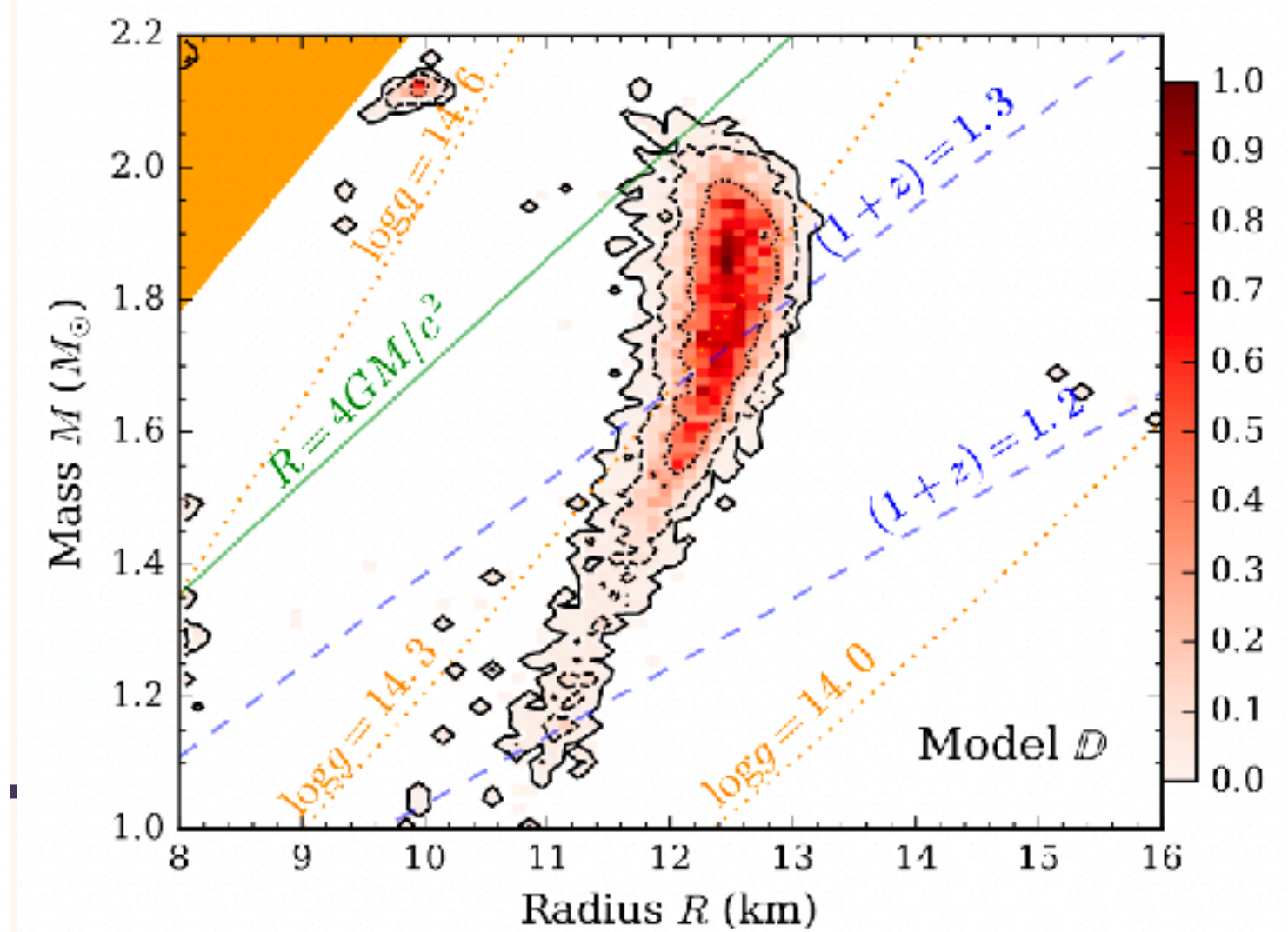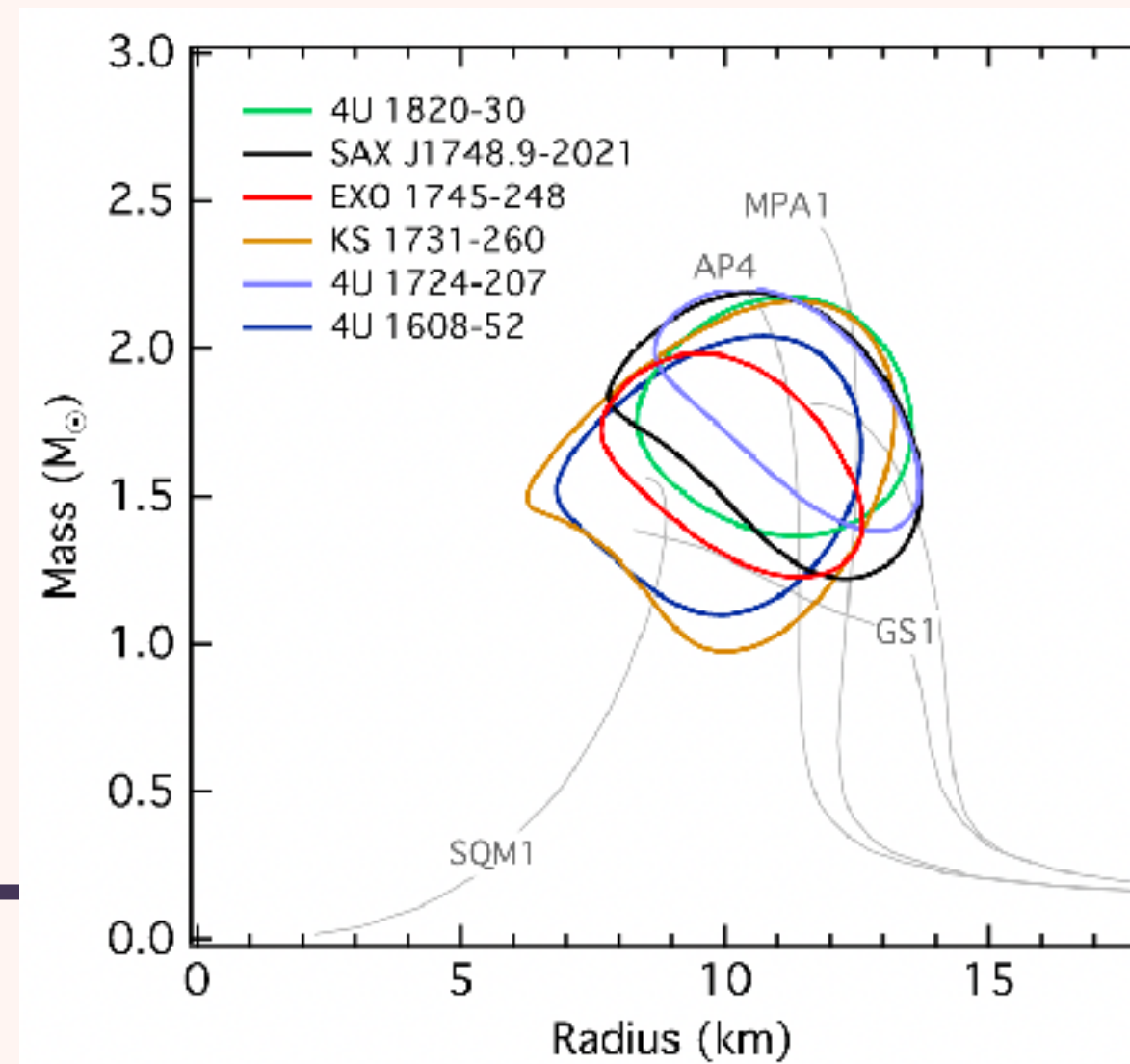
> **Which constraints ?**
  ○ **Quiescent luminosity & Mdot ?**

> **Which sources ?**
  ○ **How to select ? Pulsating ? Non-pulsating ?**
  ○ **Accreting**
  ○ **Isolated**
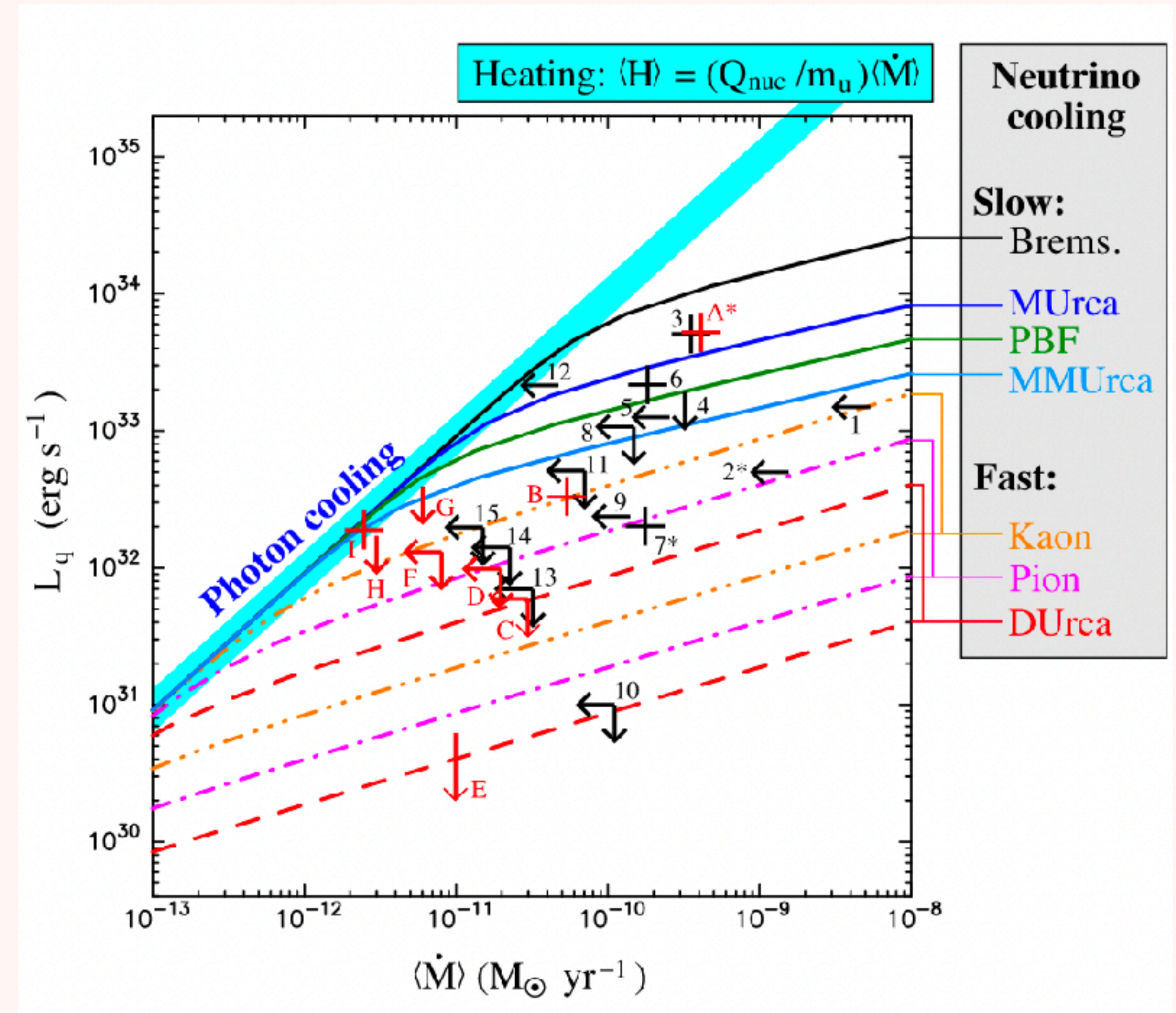
DATABASE ENTRIES

FOR EACH ENTRY

> **Date, reference, contact person ? + DOI**

> **Data type (mcmc sample density, posteriors, 1-2-3 sigma contours?)**

>> **Standard type**

> **Caveats**

>> **Try to assess the systematic vs statistical errors**

> **Analysis/models assumptions (references, if different)**

> **Curator ?**

> **Dataset number (for incremented dataset)**

> **(Reliability grade ? How to define it ?) — hard to rank!**

> **S/N ratio, detection significance ?**

DATA INPUT TYPE

> **Mcmc sample density,**

> **Marginalised likelihood posteriors**

> **1-2-3 sigma contours?**

> **Centroid + errors**

> **For Fastest and Most Massive NS:**
> ○ **Provide the limit or some probability density on the limit ?**

TOOLS TO PROVIDE (OPEN ACCESS)

> Example scripts to read the data (python notebook)

> Scripts to convert inputs into unique output format (e.g. as python library)

> Scripts for plots (with option for contour level choice, e.g., 90%)

> Example tools for quickplots (e.g., like gwplotter) – not priority

LOCATION OF REPOSITORY

GitHub
- **Collaborative**
- **Wiki**
- **Collect issues from the community**
- **Link to Zenodo / DOI**
- **GIT Large File Size ?**

Institute-hosted webpage
- **More freedom ?**
- **Less space limited ?**

Conclusion:

We will start on GitHub for development, but it might become a limitation as the database grows.
But we will assess that when the time come

SCOPE OF MANUAL / PAPER

❯ **Present purpose of the repository**

❯ **List all sources and reference of the initial release**

❯ **Present the tools provided**
  - **Conversion tools**

LONG TERM IDEAS

❯ **Include EOS model contraints**
- ○ **e.g. cEFT**
- ○ **For plotting purposes only**

❯ **Include universal relations ?**

❯ **Include upcoming constraints (expected) ??**
- ○ **e.g., moment of inertia, …**

❯ **Provide a repository for user-provided analyses that made use the database (to store in the repository)**

ACTIONS

> **Define what we want / format —> White Paper**

> > **Setup Overleaf - SG**

> > **Use overleaf to define the sub-groups — everyone**

> > > **Volunteer needed for subgroup leaders ?**

> **Everyone — sub-groups per source type to reach out to observers**

> **Setup Github — SG (on my account for now — will migrate to community account later)**

> > **Specify file format (simple txt file)**

> > **Directory per source type**

> > **Be careful with the flexibility (use HDF files)**

> **Call to the community to contribute**

NEXT MEETING ?

> **2nd half of September**