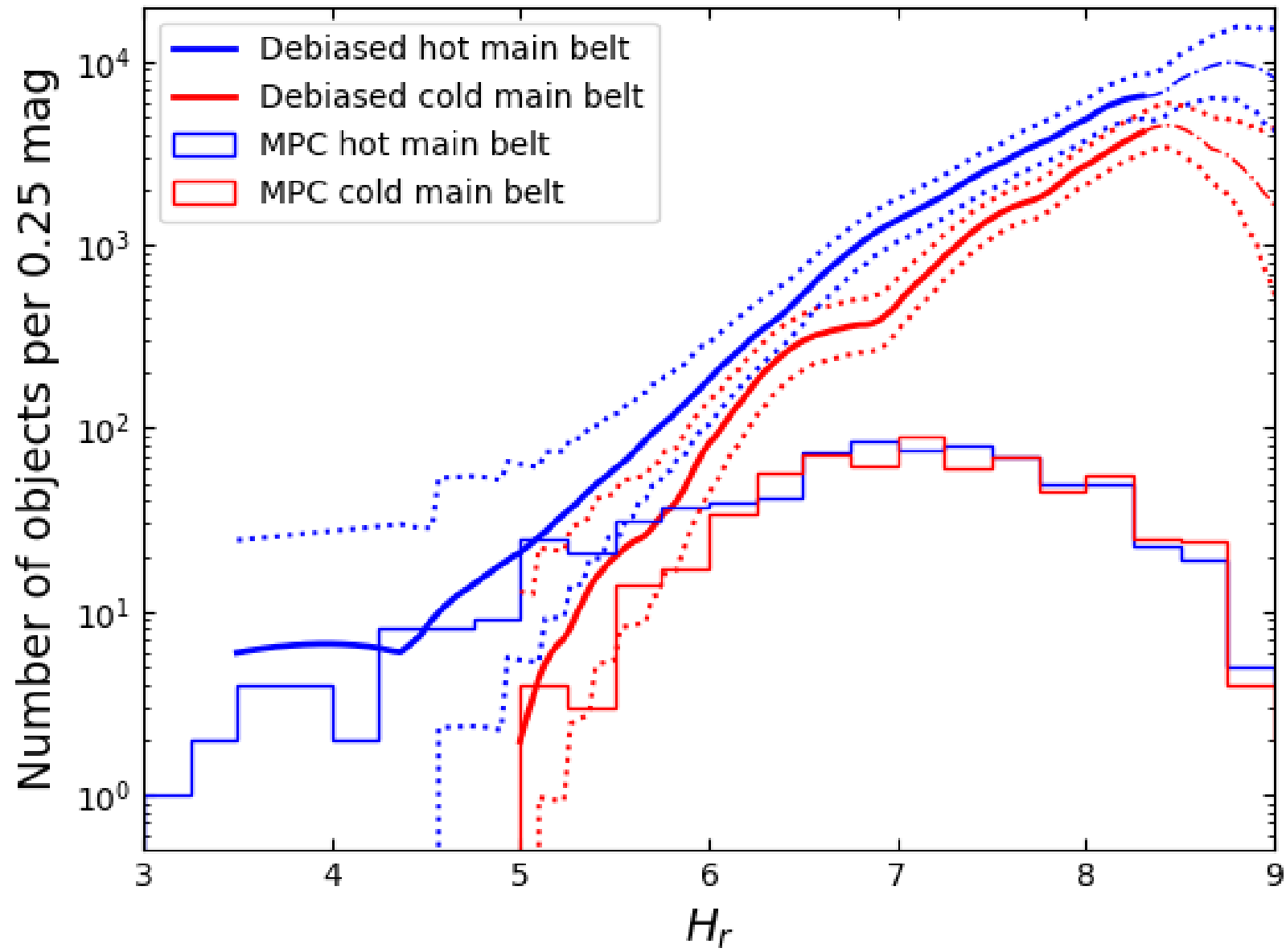


The size distribution of the hot classical belt: Streaming instability and more

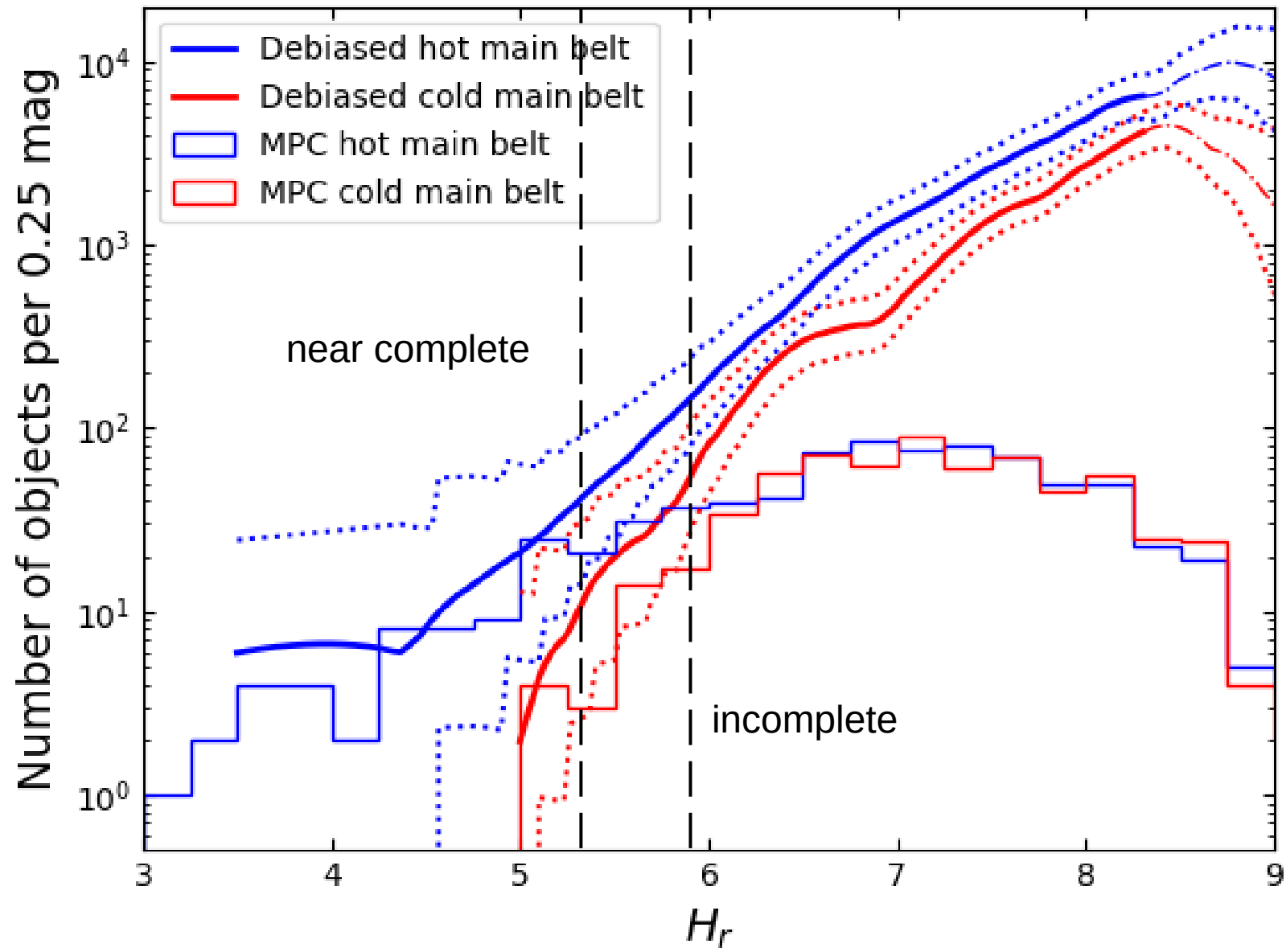
J.-M. Petit (CNRS/UBFC), B. Gladman (UBC),
J.J. Kavelaars (NRC-HAA/UVic), M. Bannister (UC),
M. Alexandersen (CfA), Y.-T. Chen (IAAAS),
S. Gwyn (NRC-HAA), K. Volk (UofA),
W. Fraser (NRC-HAA)

- Use H_r as a proxy for size
 - Only need good distances
- Hot / Cold based on *proper inclination*
 - Not ecliptic
- Hot and Cold have same H_r distributions
 - For $5.5 \lesssim H_r \lesssim 8.5$
 - i.e. $300 \text{ km} \gtrsim D \gtrsim \text{few } 10\text{s of km}$

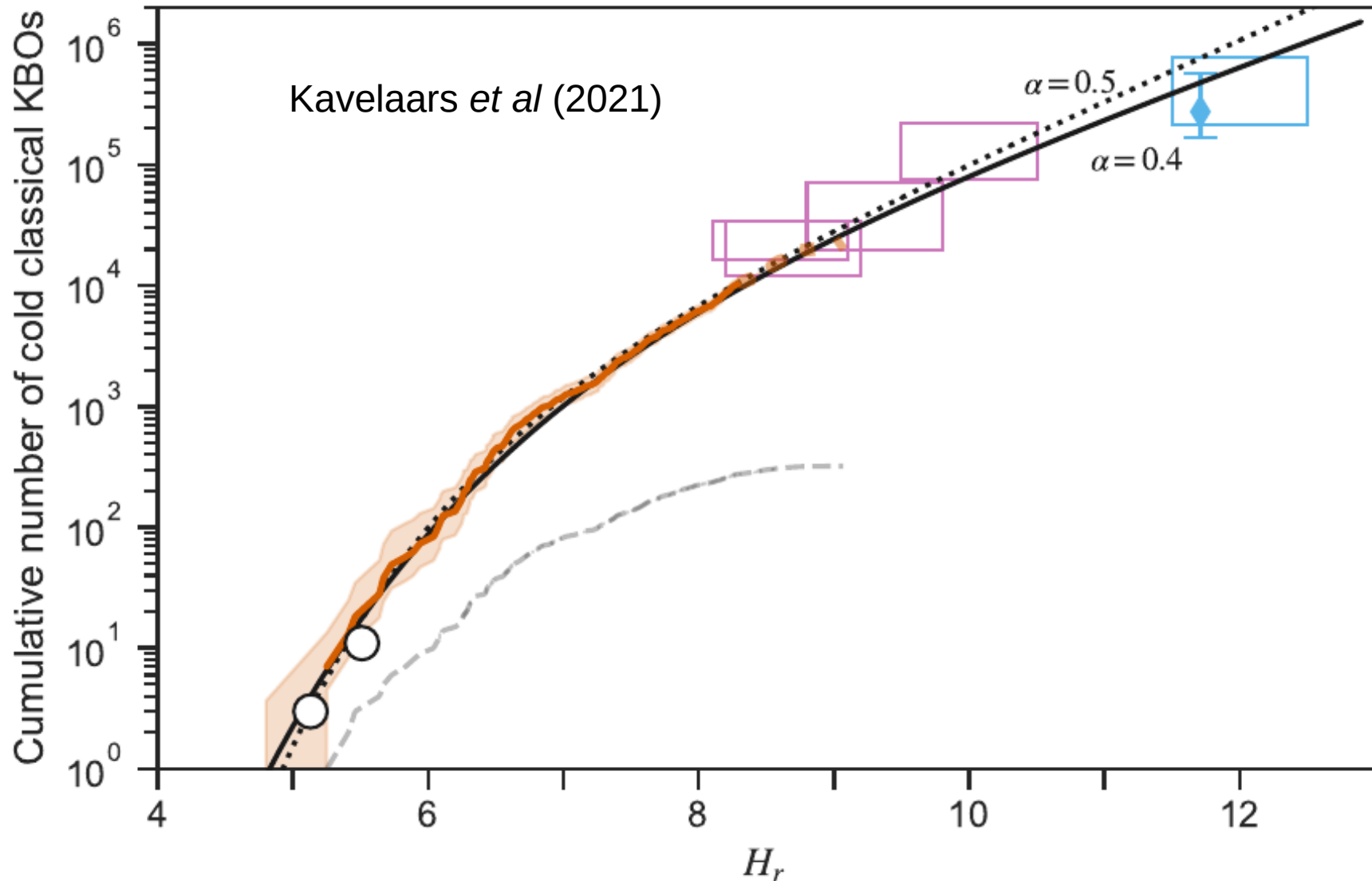
Size Distribution – Hot, Cold



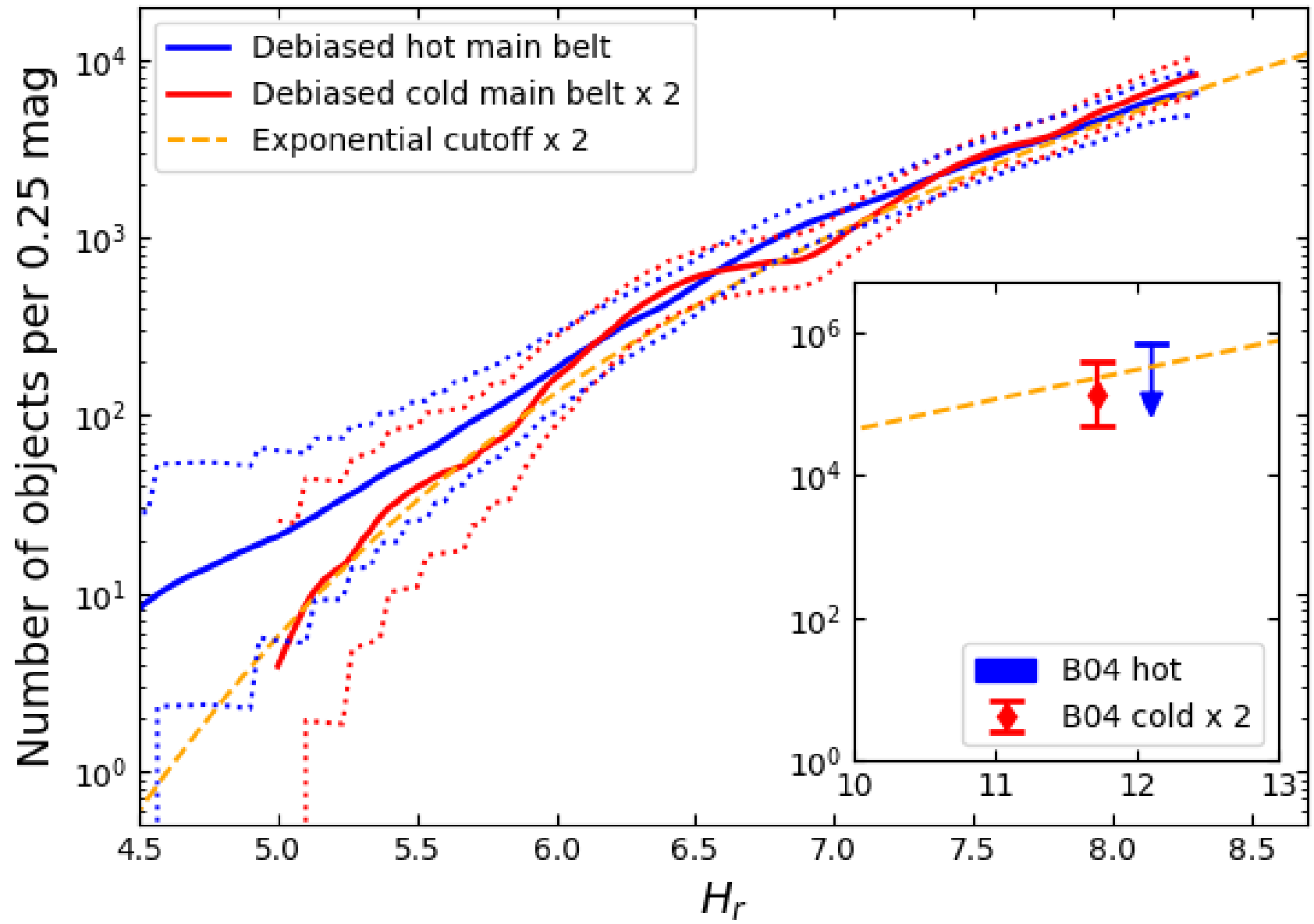
Size Distribution – Hot, Cold



Size Distribution - Cold



Size Distribution – Hot, Cold

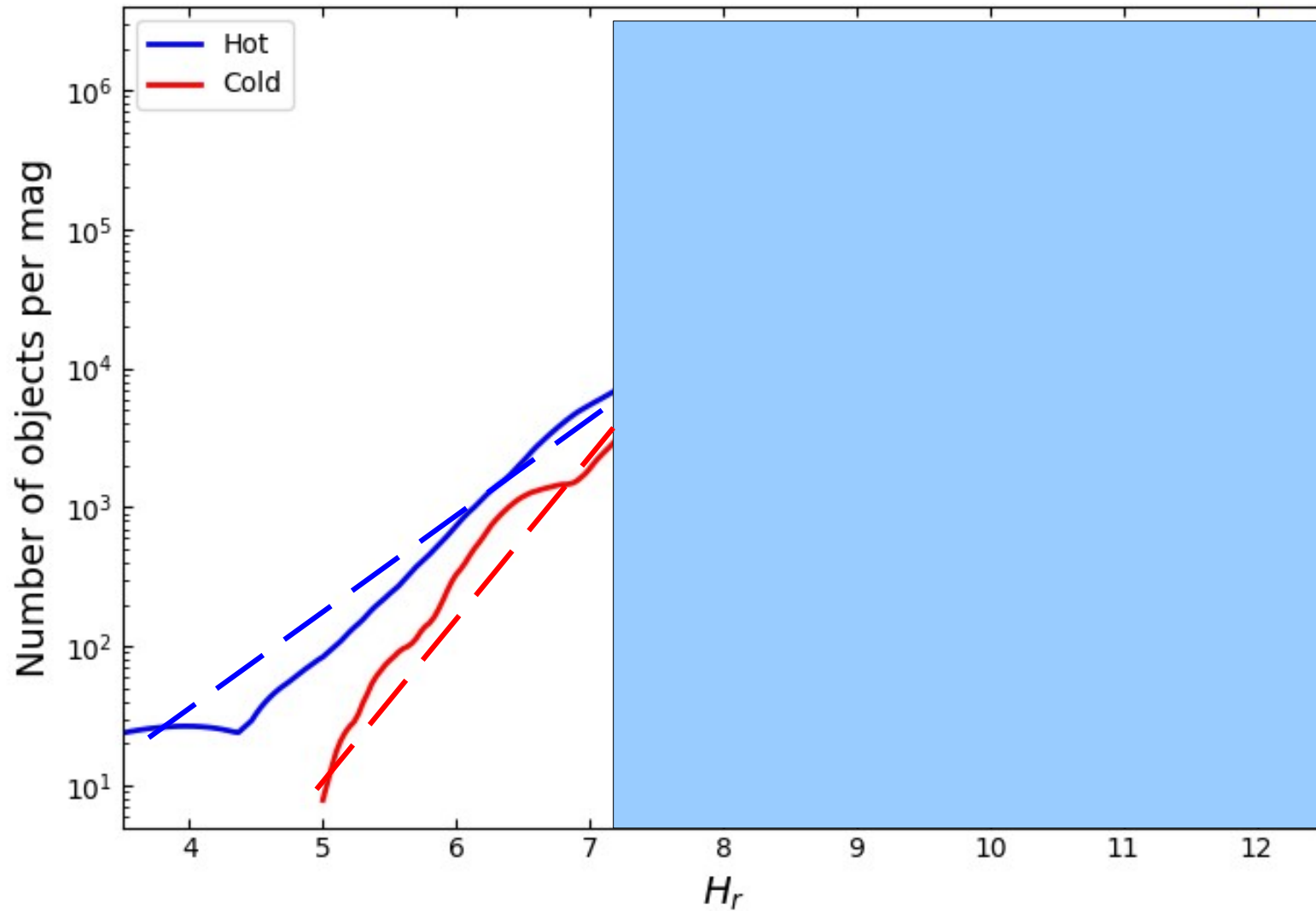


But wait a minute...

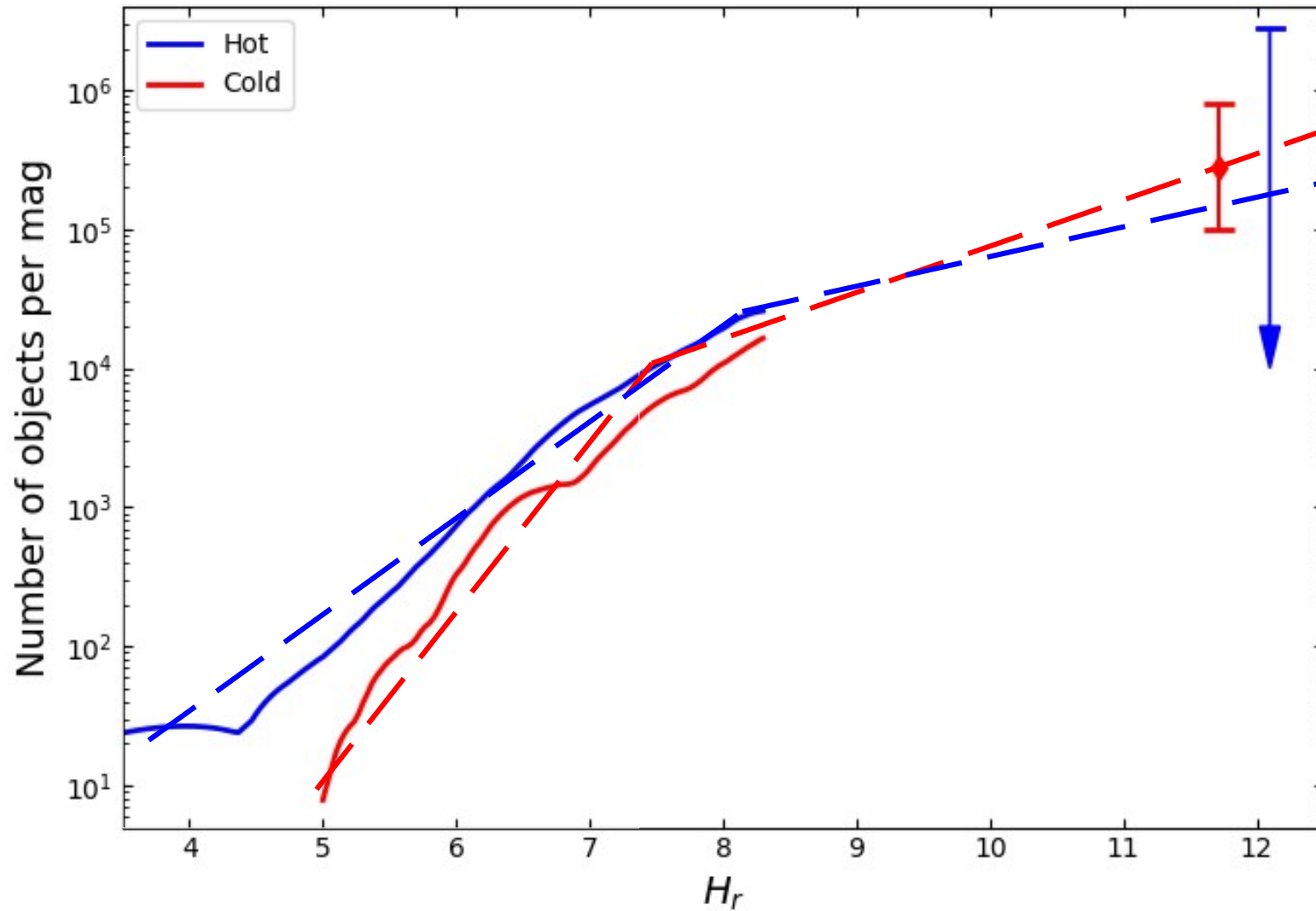
- Hot and Cold have \neq size distribution
 - Known and published:
Bernstein et al. 2004; Elliot et al. 2005;
Petit et al. 2011; Adams et al. 2014;
Fraser et al. 2014
- So what ?

Resolving the tension

- Single exponential



- Broken exponentials

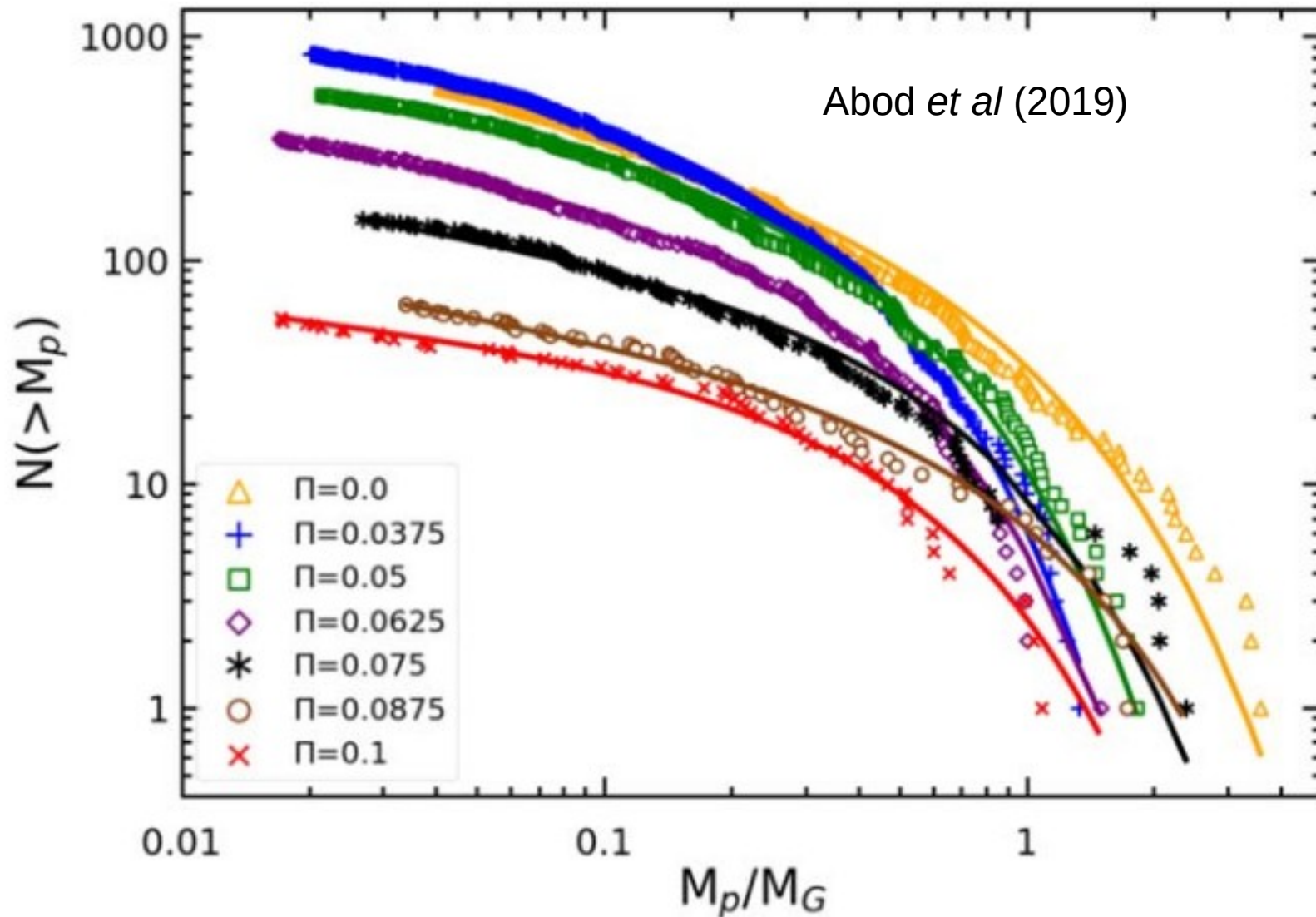


- Hot and Cold share same $H_r \gtrsim 5.5$ distributions
 - Cold population is primordial
 - Planetesimal size distribution not function of local conditions

And

- Negligible modification from collisions
 - Hot belt's compact phase is short ?

- A possible candidate: Streaming Instability



Science Implications

- Conditions in Hot-object formation region allowed accretion of larger objects
 - Erased the taper for $H_r \lesssim 6$
- Dwarf planets (and bigger objects?) accreted mass from $6 \lesssim H_r \lesssim 9$ independent of size
 - Runaway bodies didn't care about size of what they swept up

and/or

- Most of the big-object mass is pebble accretion

and

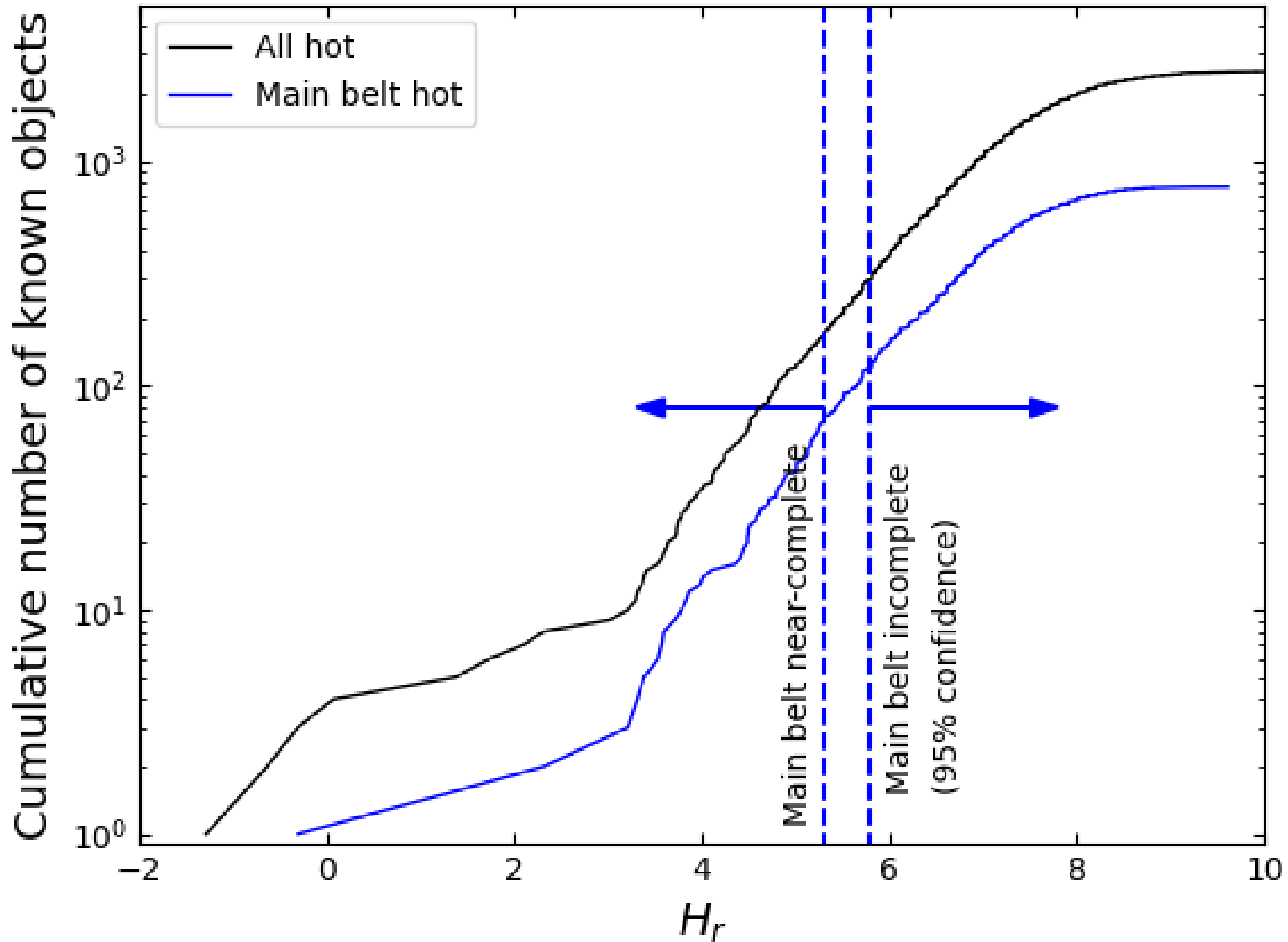
- $D \lesssim 250$ km accreted negligible pebbles

Take Away

- Classical belt ~complete for $H_r \lesssim 5.3$
- Hot and Cold are identical for $H_r \gtrsim 5.5$
 - Same initial process: Streaming Instability (?)
 - More modeling work needed
- Hot: some other process created dwarf-planet size objects
 - Accretion by runaway, pebble, ?
 - Does not change the size distribution at smaller size

Size Distribution - Hot

MPC sample



Streaming Instability - Mass

Run I ($t_{sg} = 7.5/\Omega$)

Li et al (2019)

