



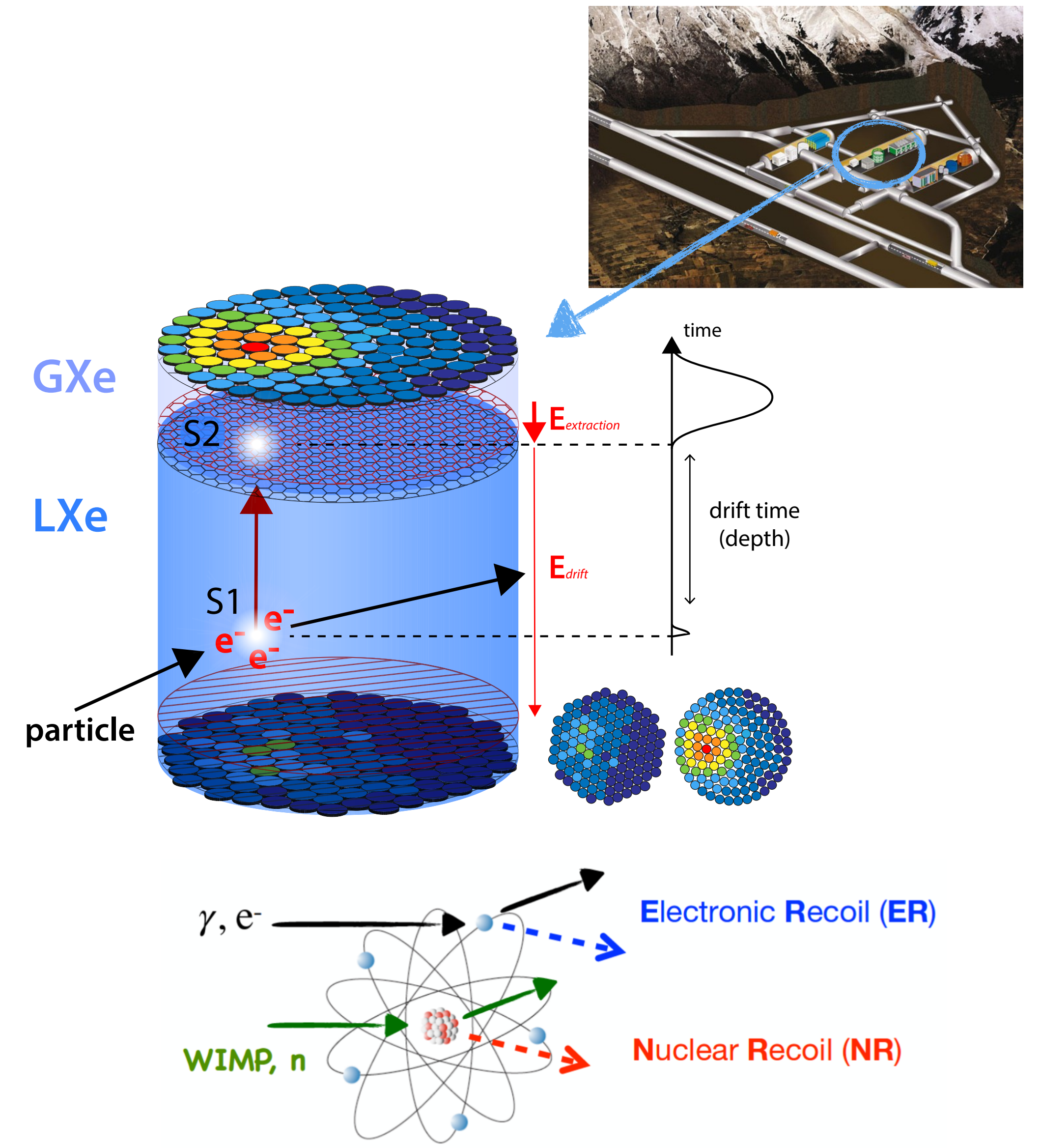
WIMP Candidate and Direct Detection

- Massive
- Non-relativistic
- Interaction on weak scale
- Electrically neutral

Weakly Interactive Massive Particle

How does the direct detection with xenon as a target work?

- Underground labs to shield against cosmic rays → LNGS buried under 3600 meters water equivalent
- Dual-phase xenon time projection chamber → energy and 3D-position reconstruction and ER-NR identification
- Elastic collision with Xe nuclei → Search for nuclear recoil signal



XENON Project

XENON10	XENON100	XENON1T	XENONnT
2005-2007	2008-2016	2012-2018	2019-2023
25 kg - 15cm	161 kg - 30 cm	3.2 ton - 1 m	8 ton - 1.4 m
~10 ⁻⁴³ cm ²	~10 ⁻⁴⁵ cm ²	~10 ⁻⁴⁷ cm ²	~10 ⁻⁴⁸ cm ²

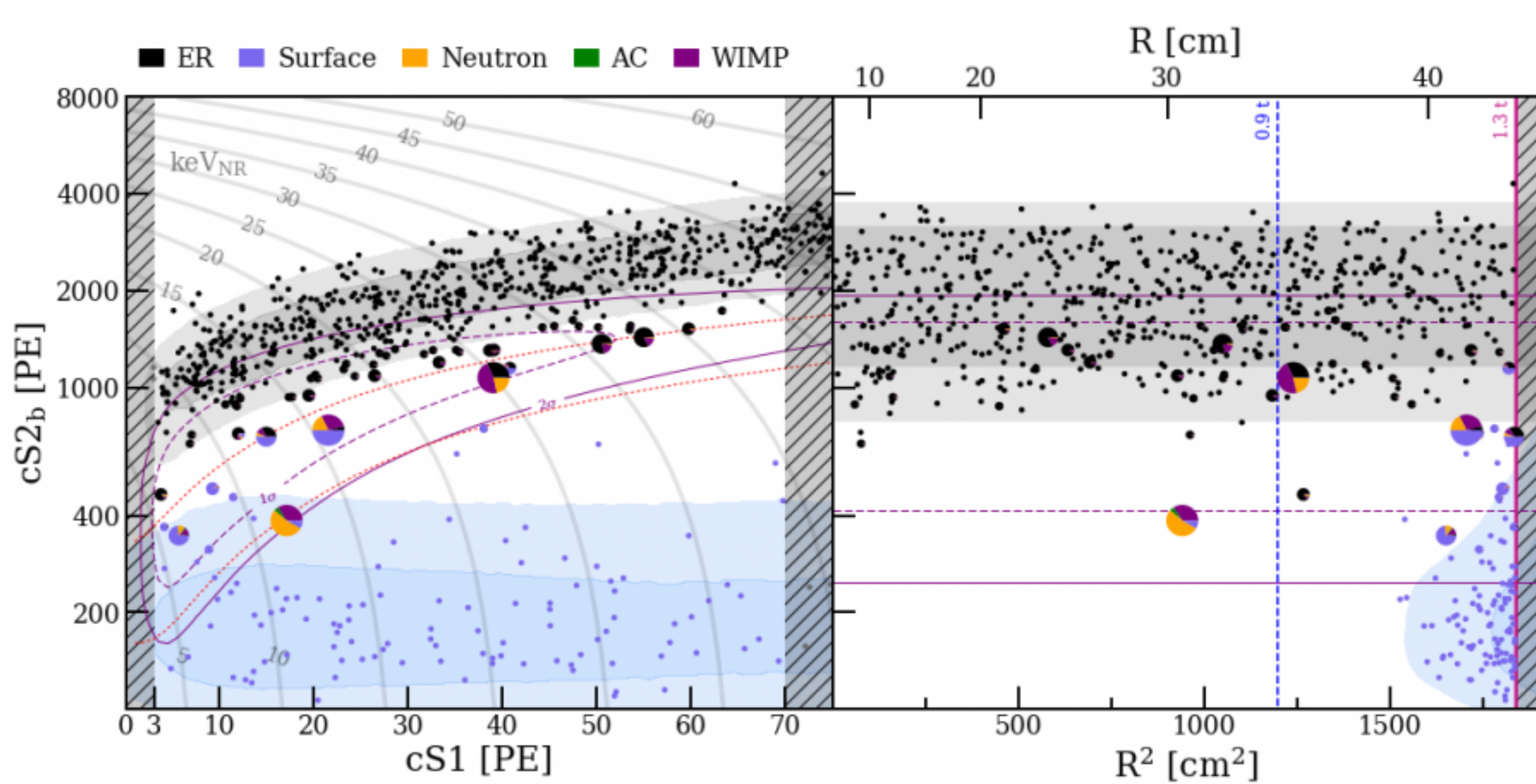
International collaboration

- 170 scientists
- 25 institutions
- 11 countries



XENON1T Results

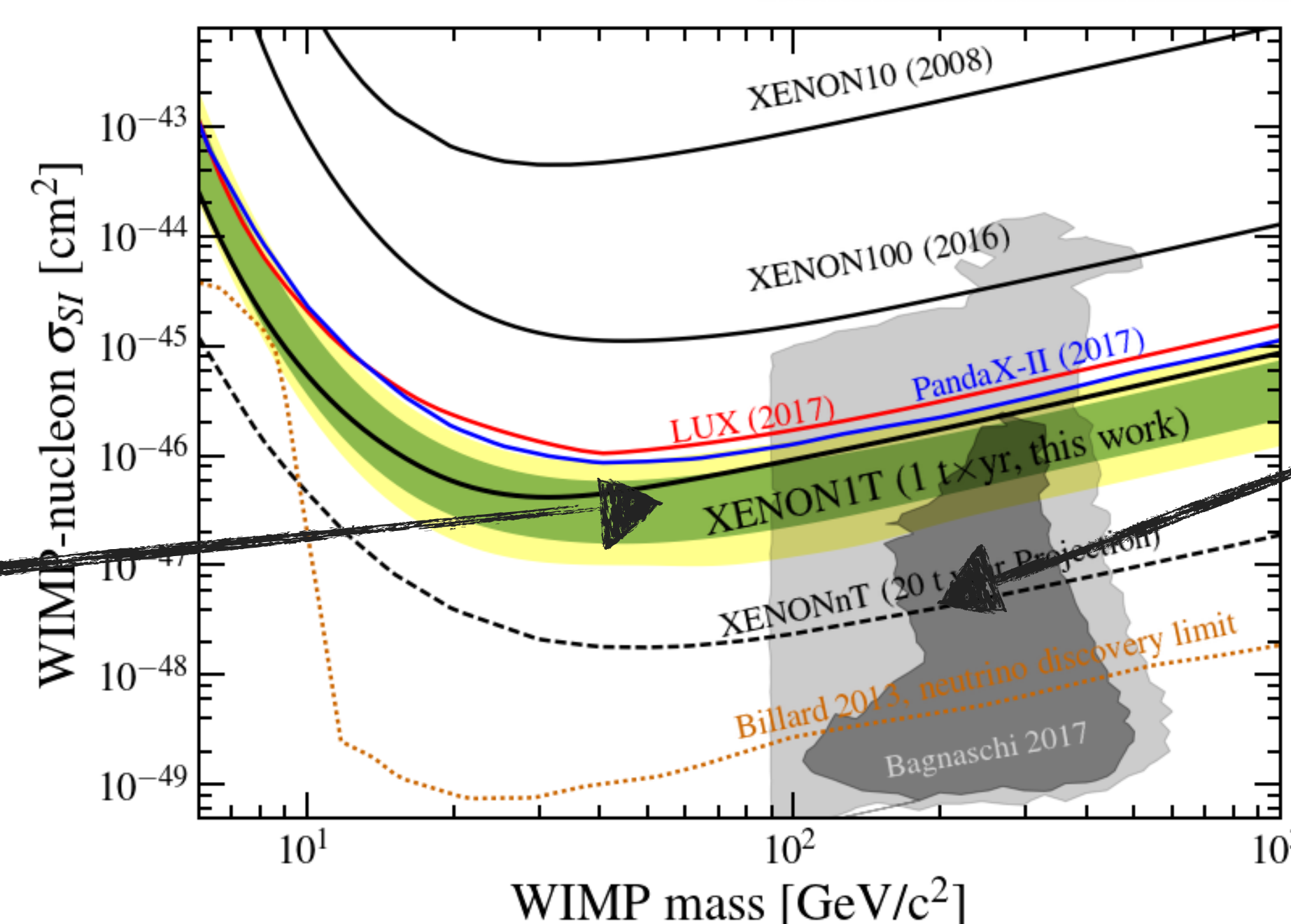
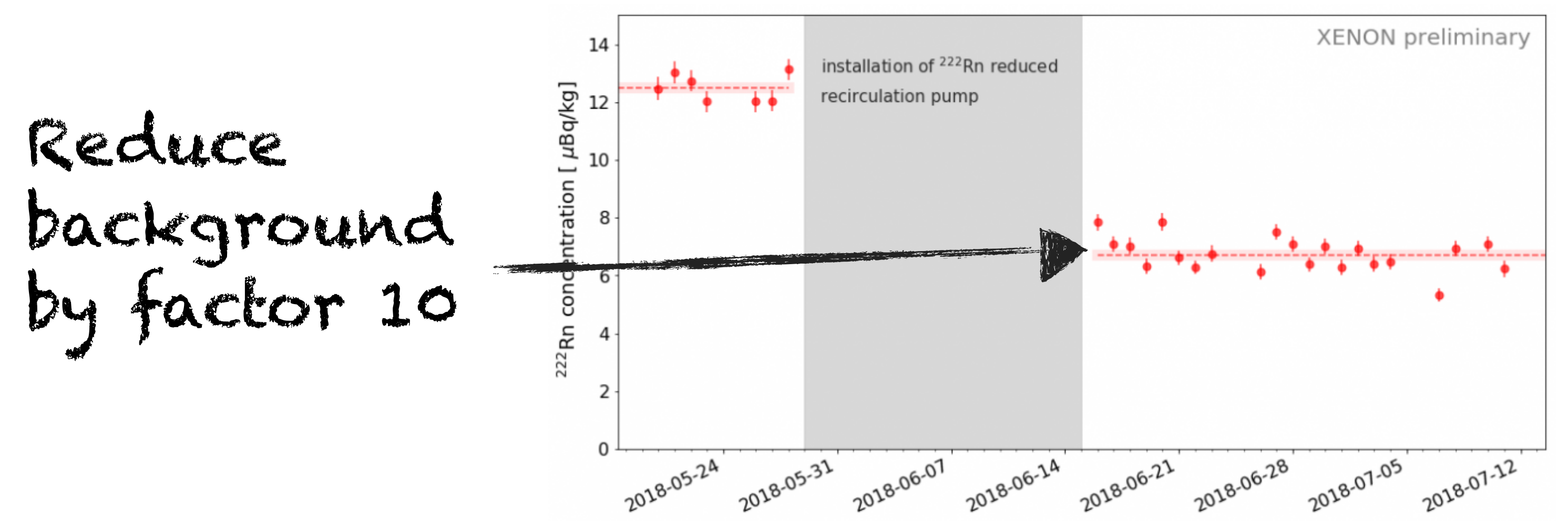
- 1 ton·year exposure
- Lowest ER background in DM detector: (82⁺⁵₋₃ (syst) ± 3(stat)) events/(ton·year·keV_{ee})



- Best 90% CL exclusion limit on SI WIMP interaction above 6 GeV/c²
- Minimum $\sigma_{SI} \approx 4.1 \times 10^{-47} \text{cm}^2$ at 30 GeV/c²

Toward XENONnT

- Reuse some XENON1T subsystems → fast commissioning in 2019
- New TPC 1.4 m high → ~8 tonne LXe



WIMP σ_{SI}
~10⁻⁴⁸ cm²