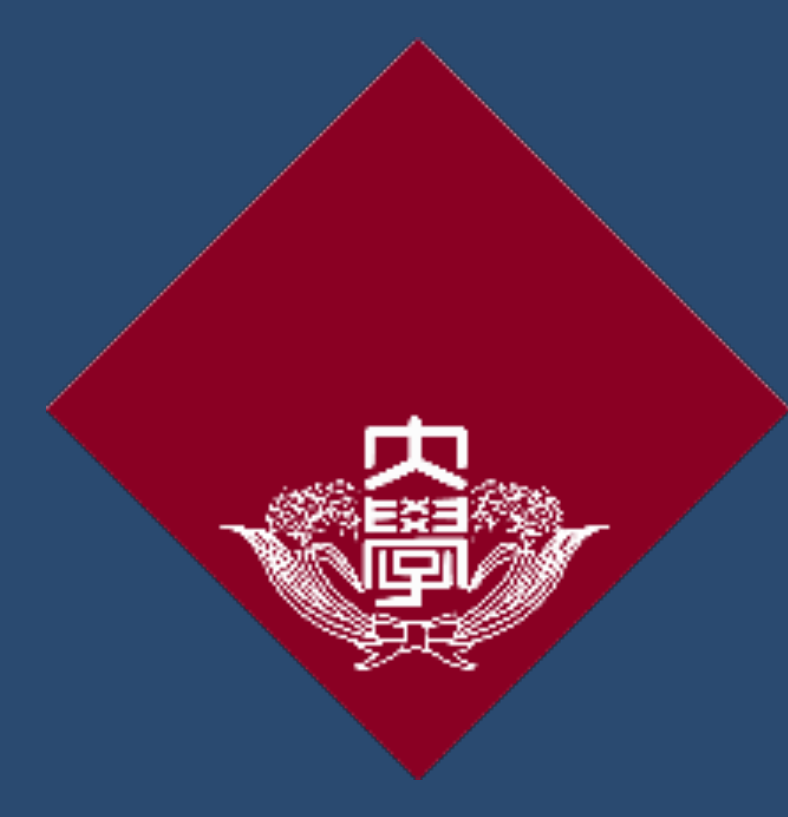




GRAMS Engineering Balloon Flight

Riki Nakajima (Waseda University)

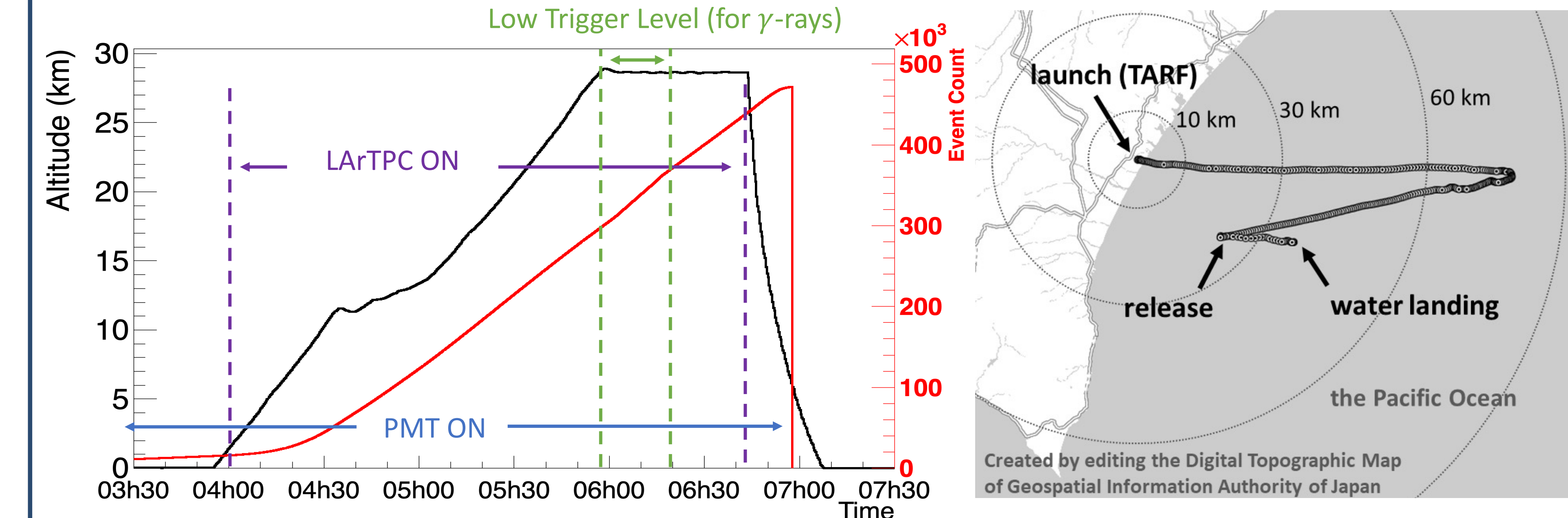
On behalf of the GRAMS Collaboration



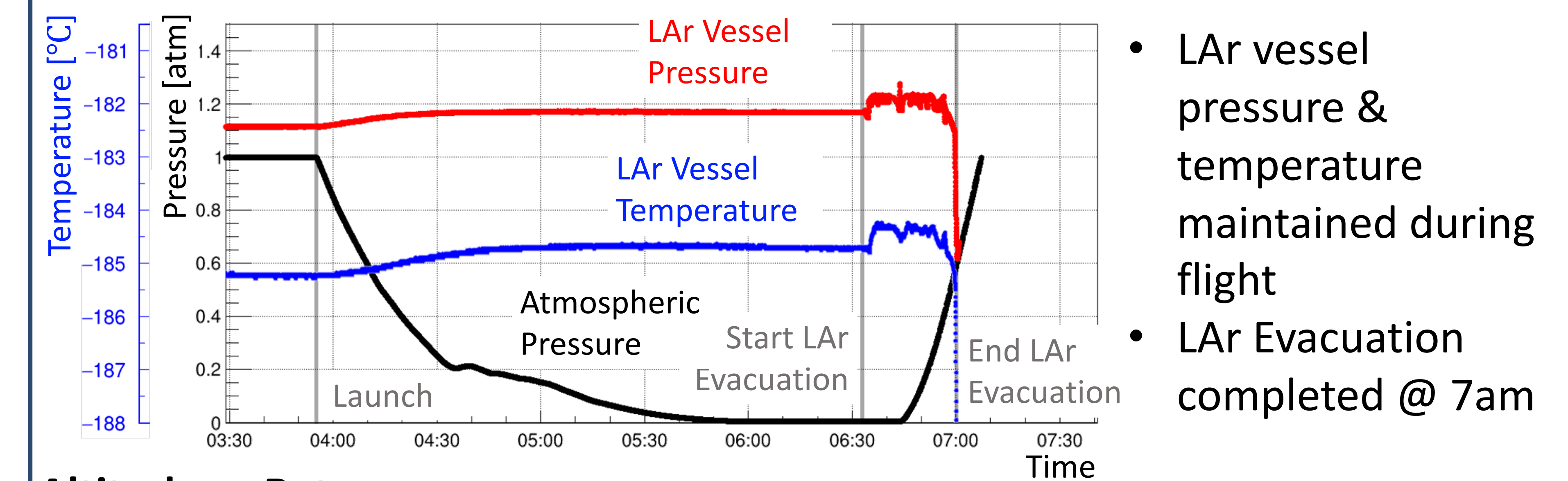
5. Results

Flight Operation:

- Total Flight Time: 3hr 12min, Level Flight: 44min, Max Altitude: 28.9km

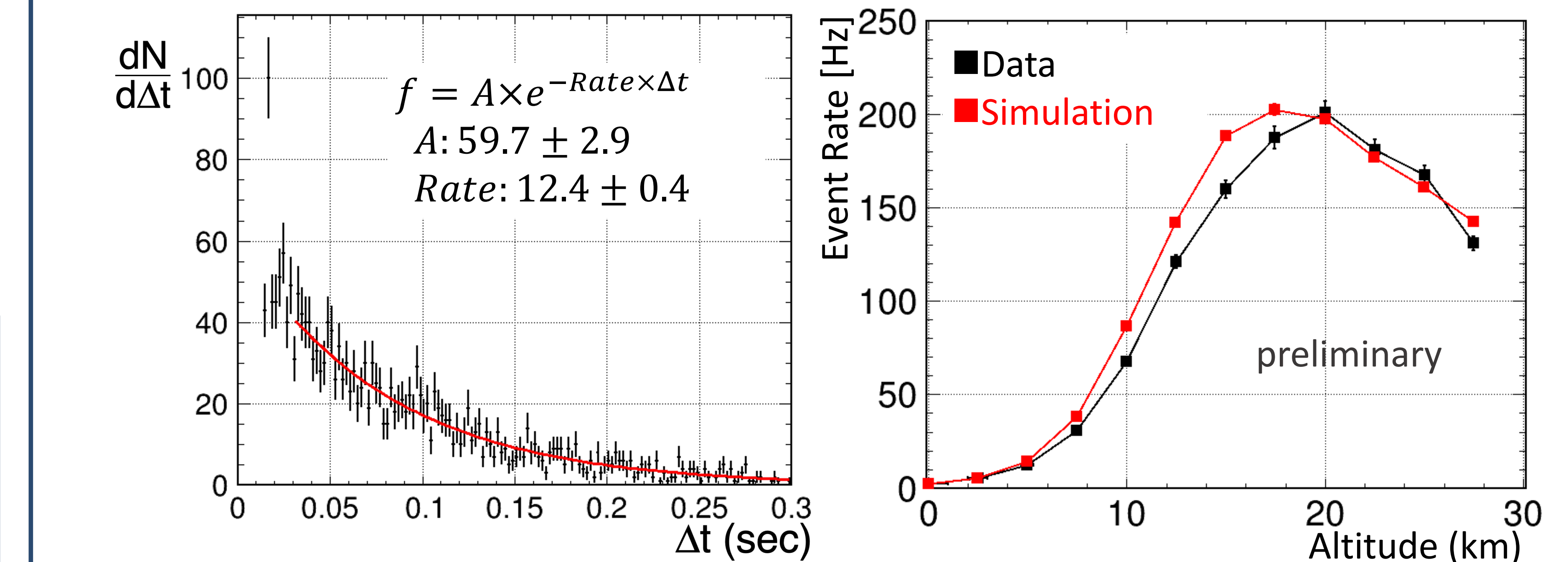


State of LAr during flight:



Altitude vs Rate:

- Data: ADC trigger rate saturated → poisson fit of Δt distribution
- Simulation: EXPACS + Geant4 5MeV threshold in LArTPC Volume



6. Summary & Prospects

Summary:

- GRAMS Engineering Balloon Flight – B23-06 was successfully completed 7/27
- LAr was stable throughout the flight & LArTPC data was obtained

Prospects:

- Further data analysis of LArTPC + PMT data is ongoing
- Approved for NASA APRA Program 2022 → larger scale LArTPC flight 2025/26

1. Gamma-Ray and AntiMatter Survey

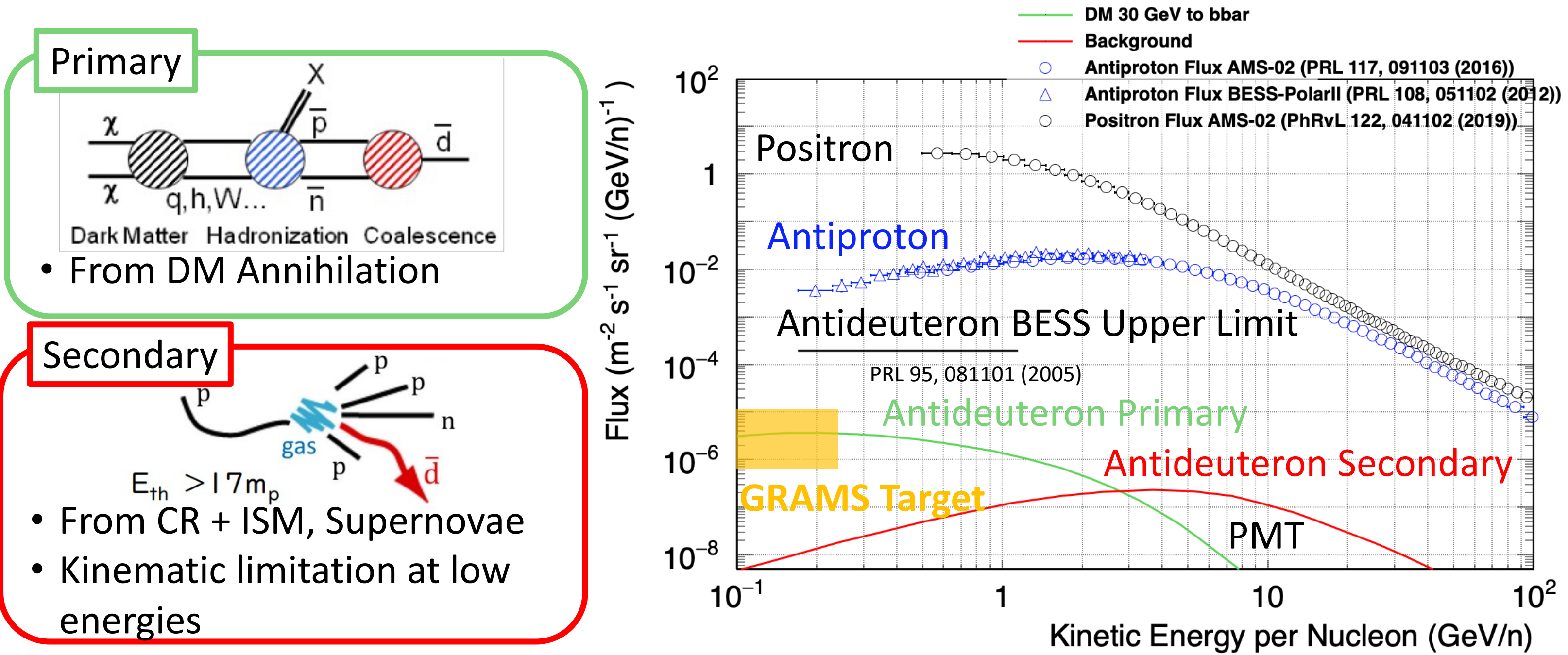
- Proposed balloon/satellite experiment using a LArTPC

Physics Motivation:

- MeV Gamma-Ray Observation → Nucleosynthesis, PBH...
- Cosmic Antimatter Detection → Indirect DM Search

Indirect DM Search using Cosmic Antimatter:

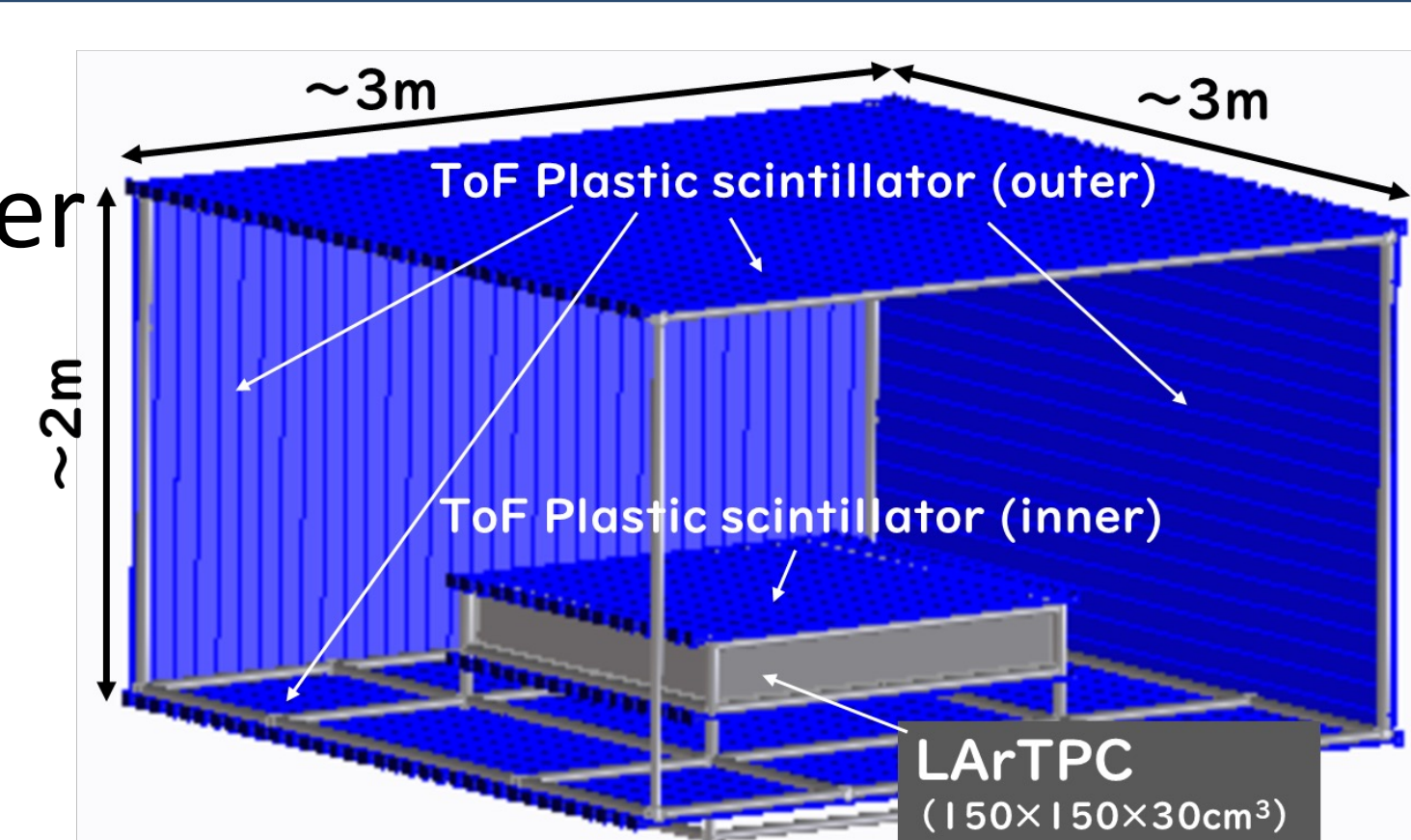
- Antideuterons have never been observed



2. GRAMS Detector

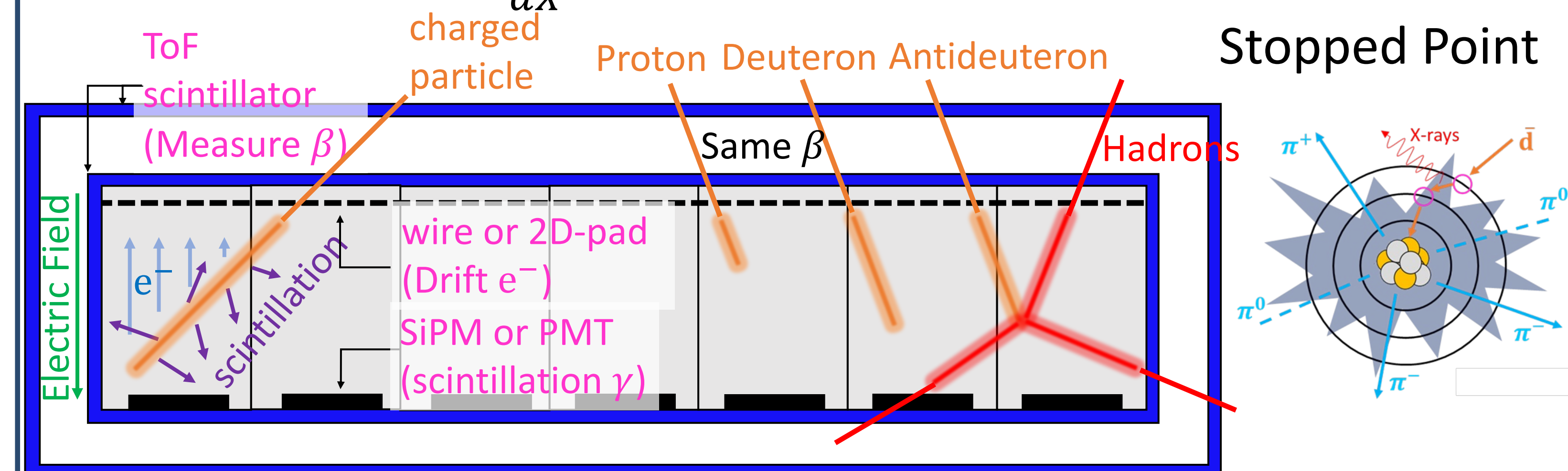
LArTPC + 2 Layer ToFs:

- LArTPC: Calorimeter/Particle Tracker
- ToF: Measure Velocity β
- Cost effective, expandable, no dead volume
- ~30 days ~40km above south pole to reach target sensitivity



Particle Identification Method:

- Different Mass: $\beta + \frac{dE}{dX}$ + Range Matter - AntiMatter: Reaction @ Stopped Point



3. GRAMS Engineering Balloon Flight – B23-06

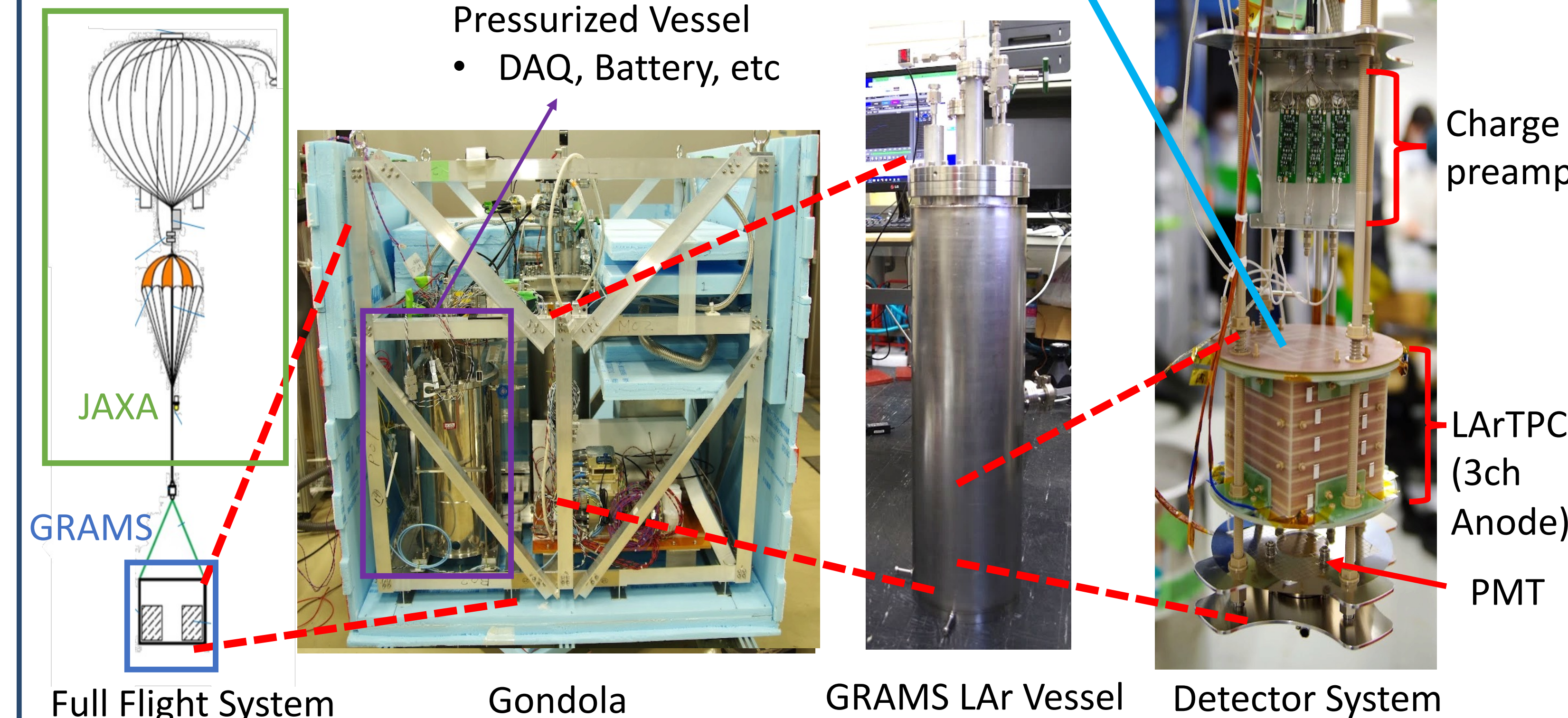
JAXA TARF (@Hokkaido, Obihiro)

- Taiki Aerospace Research Field → JAXA's balloon launching site
- B23-06 was accepted for 2023 flight

Objective:

- Establish safe LAr handling system @ balloon altitudes
- Operate LArTPC & collect cosmic ray data

System Overview:



4. Liquid Argon Handling System

