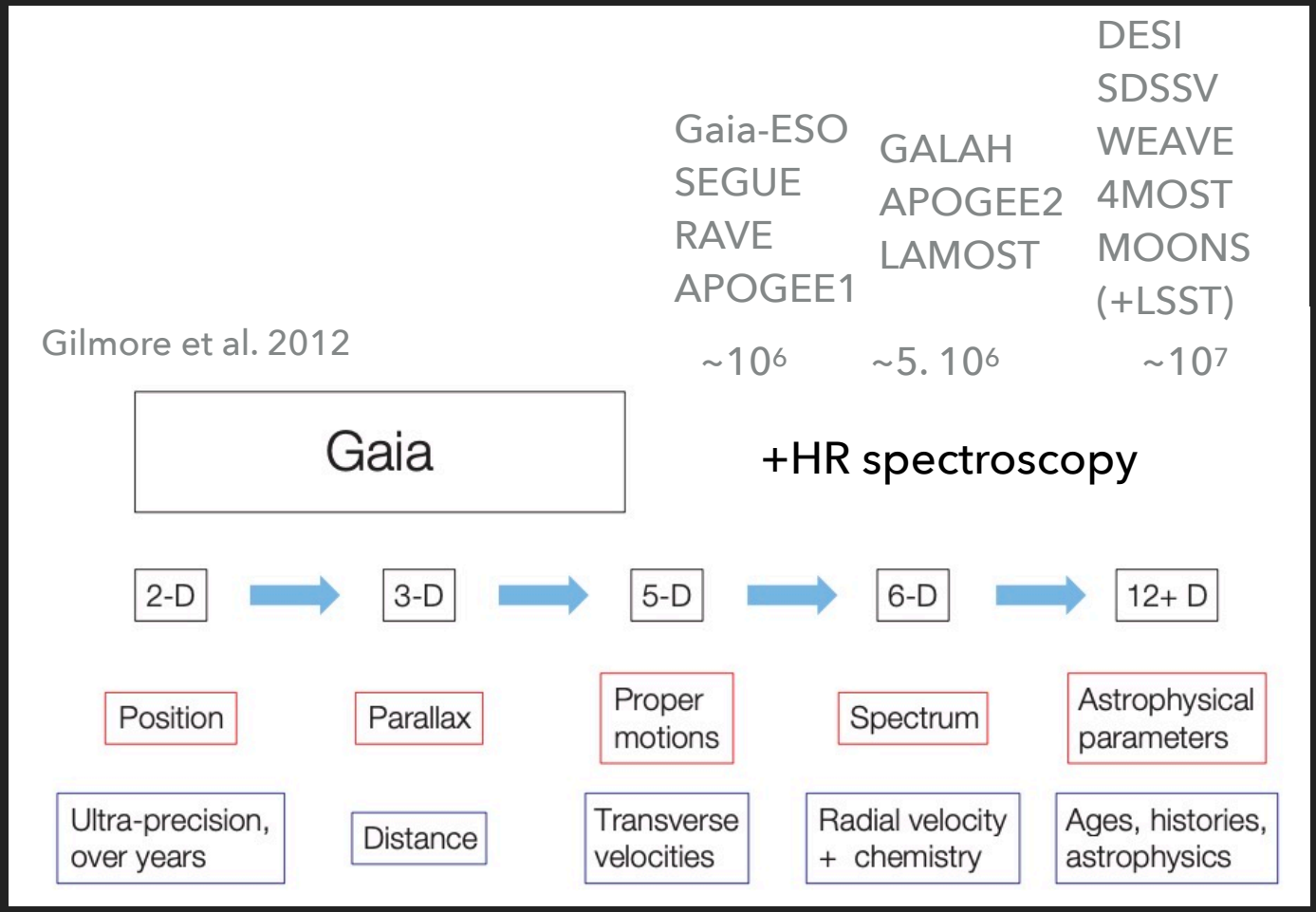
SARA LUCATELLO - OAPD

ON BEHALF OF THE TEAM

CHEmo-dynamical Tagging in the Age of Large Surveys

SCIENTIFIC AIMS: BACKGROUND

- Unprecedented wealth of data is becoming available: age of the surveys;
- Galactic Archeology allows to probe the Galaxy but also structure formation in general: MW is laboratory and keystone.
- Considerable work at INAF on this (direct investment with WEAVE and MOONS, but also GES, 4MOST, SDSS-III, SDSS-IV, SDSS-V);

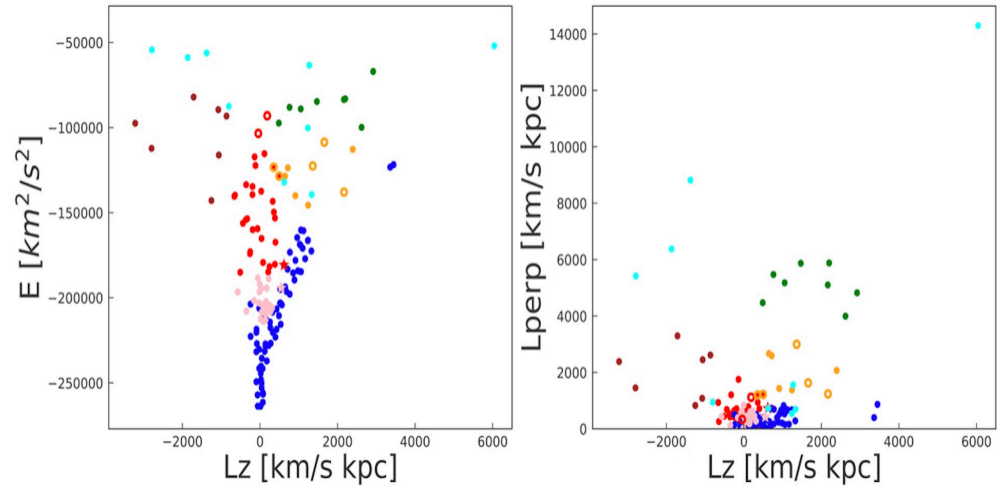


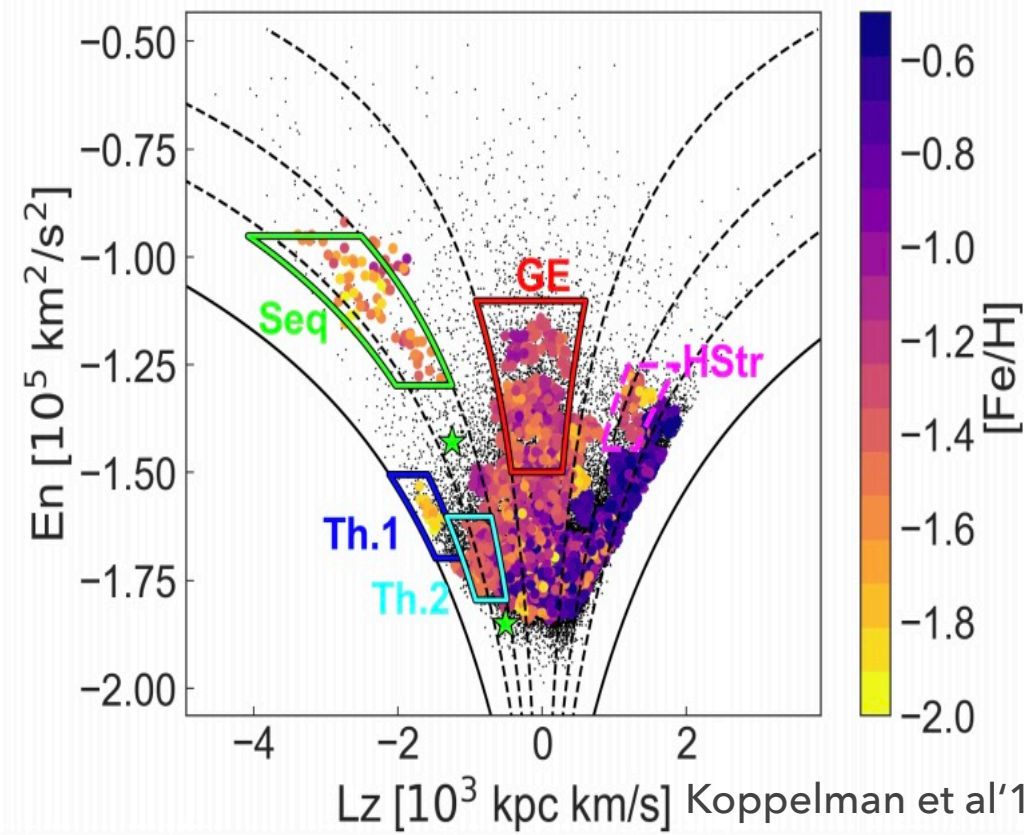
Stellar parameters with Gaia distances, pm, RVs and chemical composition provide multi-dimensional map of the Galaxy

SCIENTIFIC AIMS: PROBING THE MW HALO

- Composition+space motions allow chemo-dynamical tagging;
- Allow to detect and investigate substructures and trace back groups of stars that formed together but since dispersed;
- HR Spectra from WEAVE (core) + already available public data (e.g. APOGEE, GALAH, LAMOST, GES). Future data (e.g. SDSSV, 4MOST, MOONS, DESI) will be added. LSST data will later on (pm and positions for faint stars etc).
- Total ≥10^4 halo stars with HR spectra dwarf and giants over 2,000 deg^2 on the sky;

Massari et al 2019



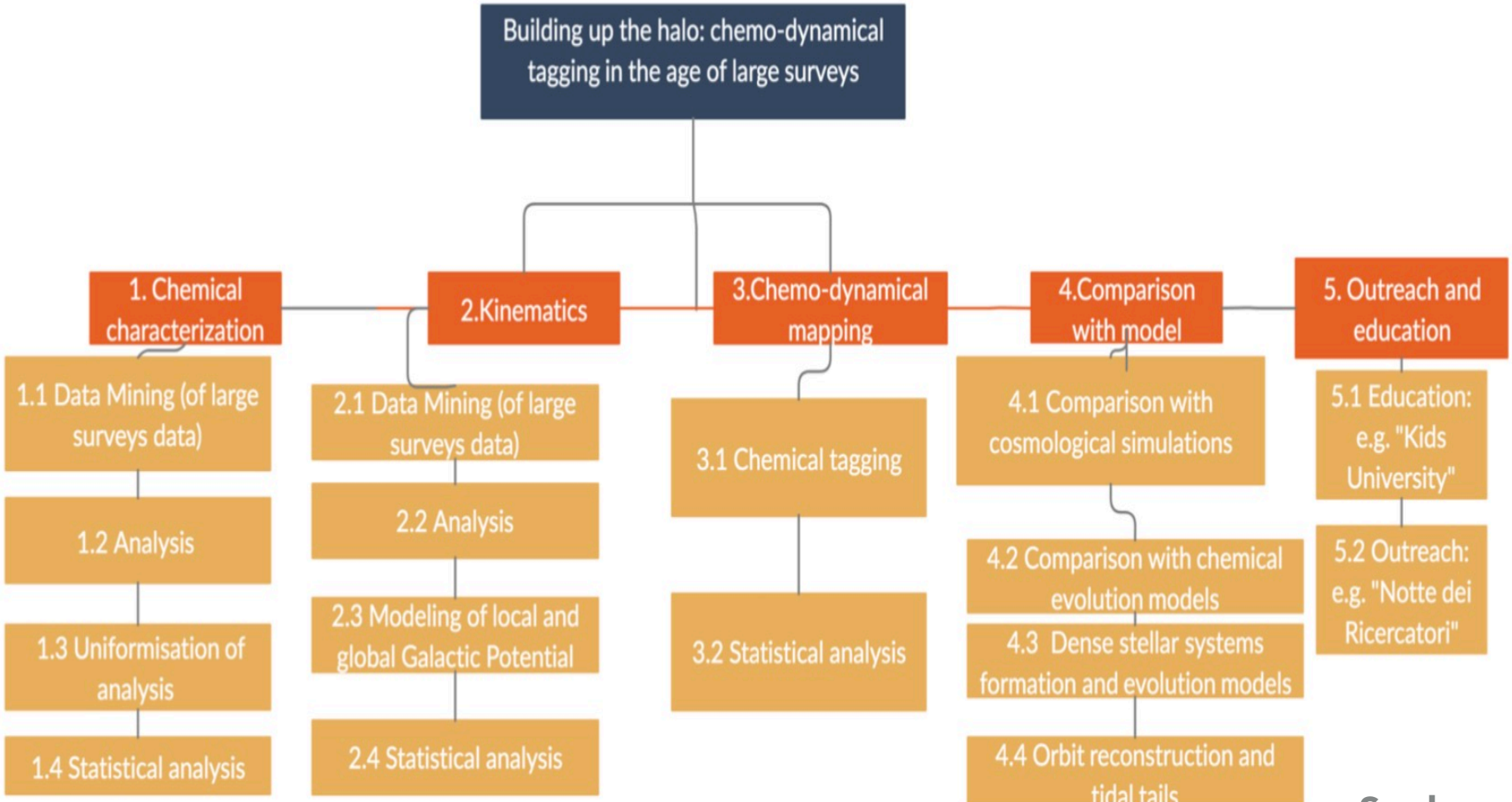


Koppelman et al'19

EXPECTED RESULTS AND PERSPECTIVES

- Multi-dimensional mapping (pm, position, velocities, atmospheric parameters, and detailed composition) for at least 10^4 Halo stars.
- Dataset ~2-3 times larger than previous surveys but ~5 times larger than any sample collected before with n-capture elements abundance. This will allow to:
  - i) trace back origin of disrupted satellites (e.g. small galaxies and/or globular clusters) , also probing the issue of accreted vs “in-situ” halo.
  - ii) build an accurate and statistically robust chemo-dynamical map of the Halo (trends, correlations, peculiar objects etc). This allows also to test chemical evolution models;
  - **iii)** support and promote at the international level the Italian leadership in the study of stellar populations and of the Galaxy formation and evolution.
- Development of software tools designed to explore and parse the data ;
- Organise public engagement events;

PROJECT PLANNING



Carretta
Bragaglia
Dall'Agli
Lucatello
Vallenari
Ventura

Sollima
Bellazzini
Massari
Sordo
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Vallenari
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Massari

TEAM: INAF PERMANENT STAFF

0.8FTE/yr

1.3FTE/yr

0.4FTE/yr

→ Total= 2.5FTE/yr

TEAM: NON-INAF STAFF

- Several non INAF collaborators, in Italy and abroad, will contribute (Abu Dhabi/Toronto WP 3, Universita' Perugia WP3, Universita' di Padova, WP 1 and 3);
- Also collaboration with the WEAVE GA team;
- Project requires 3yr AdR;
- Contribution from temporary personnel and external scientists <30%
- Given the composition of the team, the INAF leadership is obvious. Moreover, many past and present leadership roles in large GA projects;

FUNDING

- PRIN INAF 2019 “Chemo-dynamical Tagging in the Age of Large Surveys”: requested 200K (full amount for the project) funded ~80K. Already available;
- 1 PhD student fully funded by Beca Chile (until 2023);
- Application for related:
  - PRIN MIUR 2020 (pending);
  - Horizon2020 funding (pending);
- Will continue to apply for relevant national and international calls as they become available;

CRITICAL AREAS

- Timeline delays due to Covid-19;
- Mismatch between funding use deadline and survey delays;
- For Italian funding: hard to plan as they are not offered at predictable and/or regular intervals. Sometimes they are even canceled (e.g. premiali);
- Development of software tools require external expertise and hired workforce;
- Long term investment on big data tools: connection with external experts (from informatics), new hires, training of early career scientists etc