Galaxy Modelling with a Gaia mock catalogue

- 2nd WGA1 GREAT ESF Workshop

- WGA1: The Gaia - Model Interface

- @ Universitat de Barcelona (Spain)

- 29 February - 2 March 2012

Organisers
Teresa Antoja (Groningen), James Binney (Oxford), Anthony Brown (Leiden), Victor Debattista (UCLan), Francesca Figueras (Barcelona, LOC Chair), Andreea Font (Birhmingham), Amina Helmi (Groningen), Daisuke Kawata (MSSL, WGA-1 co-facillitator), Xavier Luri (Barcelona, LOC), Ivan Minchev (Potsdam), William O'Mullane (ESAC), Celin´e Reyle (Besan.con, WGA-1 co-facillitator)

- GREAT
  (Gaia Research for European Astronomy Training)

- Meeting Rationale

- GREAT Challenge?

GREAT Working Groups

| Workgroup	co-facilitator	co-facilitator
WGA1GaiaModel	Céline Reylé	Daisuke Kawata
WGA2SurveyCensus	GeorgeSeabroke	ArnaudSiebert
WGA3ChemicalTagging	Sofia Feltzing	Nicholas Walton
WGA4LocalGroup	Vasily Belokurov	Michele Bellazzini
WGA5GaiaAlerts	Simon Hodgkin	Gerry Gilmore
WGA6GaiaExtragal	Mary Kontizas	tbd
WGA7NewStats	Will O'Mullane	NicholasWalton
WGA8DistanceScales	Gisella Clementini	Xavier Luri & Enzo Brocato
WGB1OpenClusterYoungAssociation	AlessandroLanzafame	AntonellaVallenari
WGB2StellarVariability	Joris De Ridder	Laurent Eyer
WGB3BinariesAndMultipleSystems	Dimitri Pourbaix	Frederic Arenou
WGB4StellarAtmospheres	UlrikeHeiter	Alex Lobel
WGB5MassiveStars	Ronny Blomme	Janet Drew
WGB6EndStatesOfStellarEvolution	DuncanFyfe	Stefan Jordan
WGC1ExoPlanets	Alessandro Sozzetti	Don Pollacco
WGC2AstrometryReferenceFrame	Mariateresa Crosta	Géraldine Bourda
WGC3Quasars	Sonia Anton	Alexandre Andrei
WGC4SolarSystem	Paolo Tanga	Alberto Cellino
WGC5ISM	Rosine Lallement	U. Munari &T. Zwitter

Past WGA1 (Gaia-Model interface WG) activities

- "Gaia model for Gaia/GREAT Chemo-Dynamics Survey Programme"
  at MSSL, UCL, 29-30 March 2010

- "Assembling the Milky Way puzzle: structure & dynamics"
  at Le Grand Bornand, 18-22 April 2011
  organised by Céline Reylé et al.

Challenges for Galaxy modelling

- How to compare models with the real observations?

- selection function of the Gaia and complementary data? dust and various errors

- huge and complex data set.

credit: X. Luri & the DPAC-CU2.
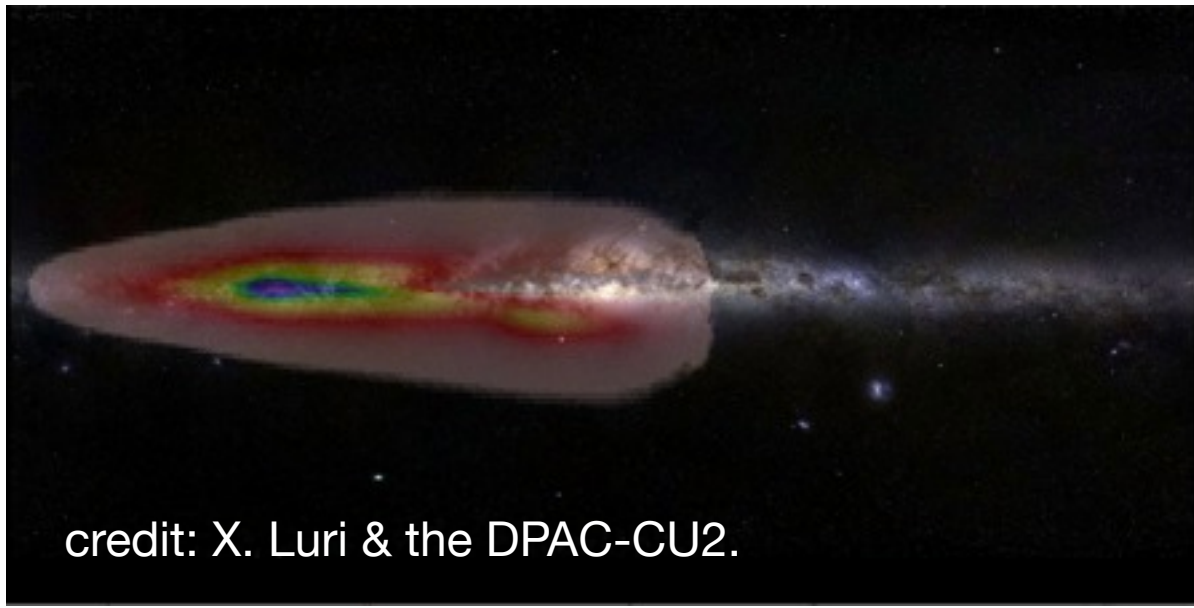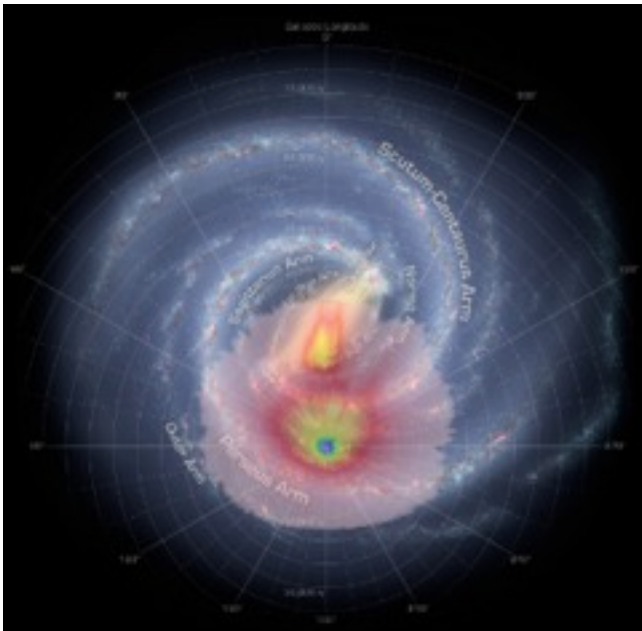
Programme
we have a plenty of discussion time!

- What we will see
  Gaia, Ground-based survey, Gaia mock catalogue

- What we need/want to do with Gaia mock catalogue

- get feeling of Mock catalogue

- Discussion

GREAT Challenge?
for example...

- Blind test, deriving scale length of discs from Mock data

- Identifying the streams in halos from Mock data

- deriving the bar and spiral arm pattern speeds from mock data

GREAT Challenge?
food for thought

- What kind of mock catalogue is needed? adding spiral arms, streams?

- How to generate different kind of mock catalogue?

- How to organise activities?

GREAT ESF Research Network Programme

- Provides funds for the wider GREAT research network

- The Programme provides financial support for the following activities:
  - Science meetings (workshops, conferences or schools) organised either by the Programme Steering Committee or following an open call for proposals
  - Grants for short and exchange visits awarded following an open call for applications
  - Publication of information brochures and leaflets, scientific books and meeting proceedings etc

- See http://www.great-esf.eu

Objectives

- establish a close link between Galaxy modelling community to the DPAC teams.

- identifying challenge of generating and using a Gaia mock catalogue.

- providing input and feedback, including use cases of a Gaia mock catalogue from the Gaia modelling community to the DPAC teams.
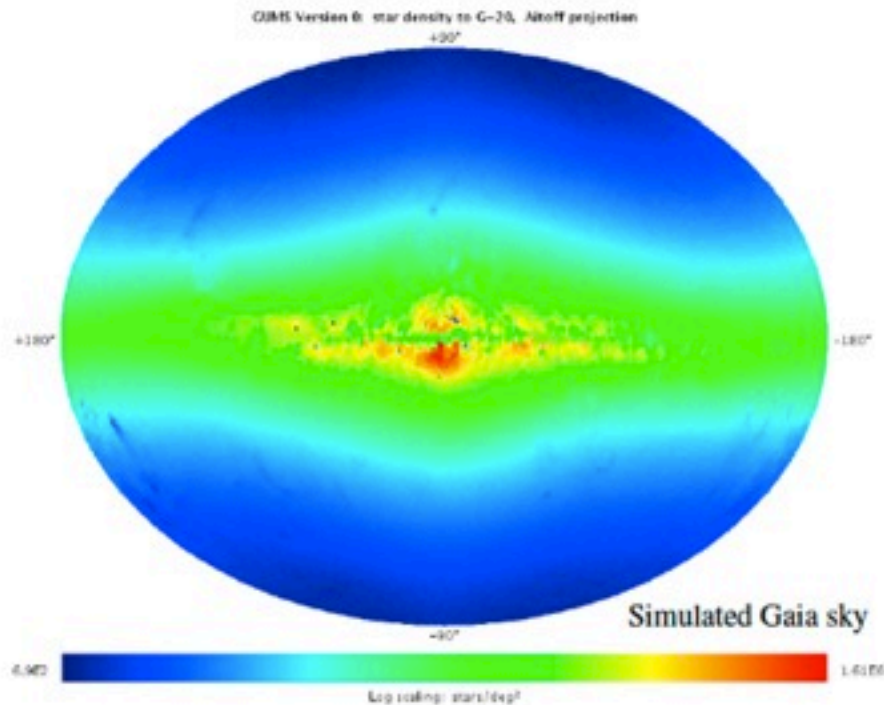
- Synergy with GREAT ITN. (Discussion session)

Are we ready?

- Three simultaneous observing modes
- Complete to $G = 20$ ($V = 20$–22)
- Observing programme: autonomous on-board detection and unbiased
- Quasi-regular time-sampling over 5 years (~ 80 observations)
- Angular resolution comparable to HST

Number of objects

- 1 billion stars to $G = 20$
- 10^6–10^7 galaxies
- 500 000 quasars
- 3×10^5 solar system bodies
- tens of thousands of exoplanets

GUMS Version 0: star density to G=20, Aitoff projection

Simulated Gaia sky

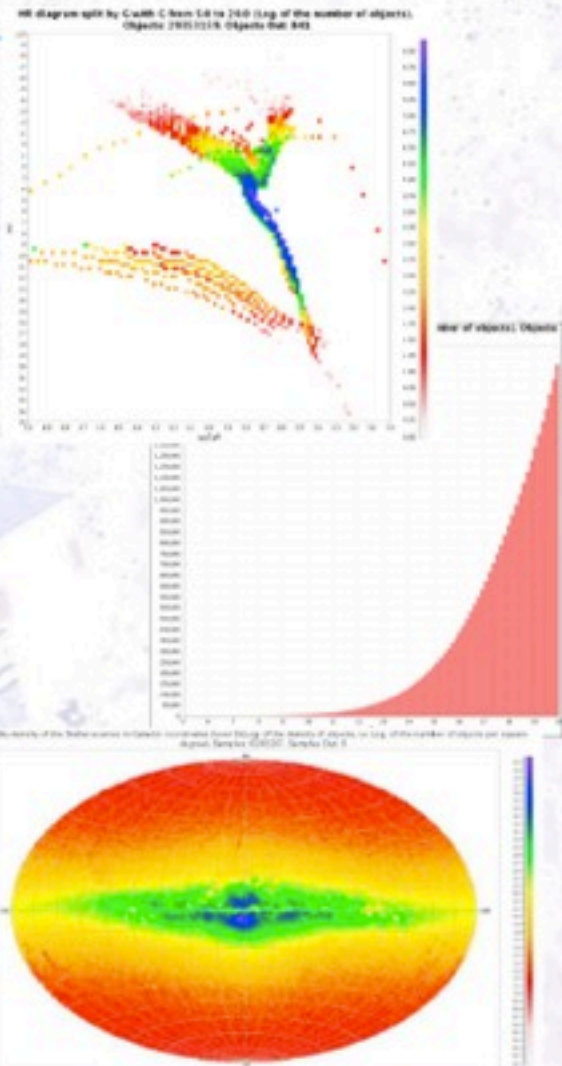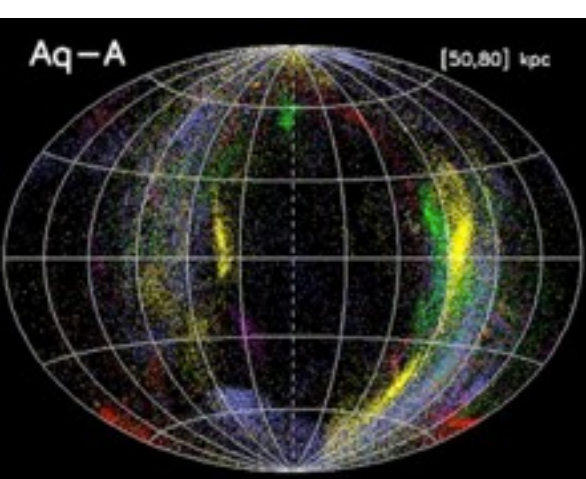Log scaling: stars/deg²

Brown's talk at Le Grand Bornand

Universe Model

+

GOG Analysis Tool (GAT)

Statistics of
tailored
catalogues!

Luri's talk at ELSA 2010

Aq–A [50,80] kpc

$\log(\mathcal{L})$

$q_\phi = 0.87^{+0.07}_{-0.04}$

$V_c = 224^{+12}_{-13}$ km/s

V_c [km/s]
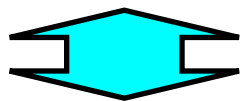
C) e.g. DPAC-CU1,CU2,GAP,GOG
Dust model
Stellar population
Gaia performance
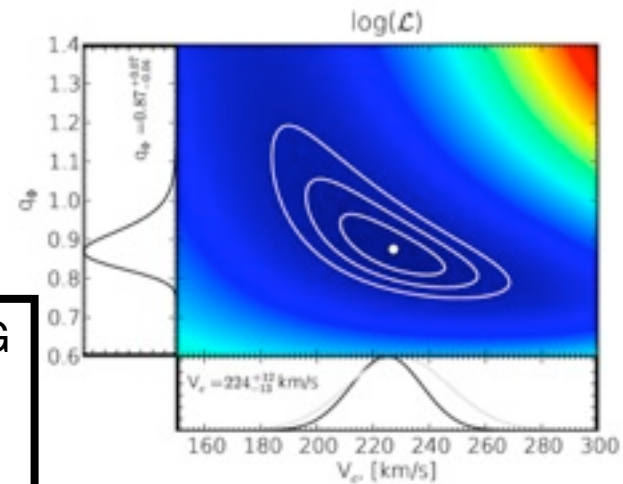
A) Simulated Galaxy
Model
e.g. N-body, SPH,
AMR
Semi-analytic

**common platform
'Gaia mock catalogue'**

B) Statistical
Analysis
Tools
e.g.Torus
M2M
Number counts

Simulated Gaia sky