Introduction and status of WG3 activities
Outline

• UN-GGIM Sub-Committee on Geodesy

• UN-GGIM: Arab States : WG3 status and activities
UN-GGIM-Sub-Committee on Geodesy & The GGRF Initiative
Why the GGRF is important: Earth science applications

- Ice melting through satellite altimetry
- Crust response to loading effects
- Sea-level variations via satellite and TG
- Volcano eruptions & their observations
- Precise Orbit Determination
- Co & Post-Seismic deformations
- Post-Glacial Rebound
- Tectonic motion & deformation
- Earth Rotation
- Center of Mass Provided by SLR
Why the GGRF is Important: Societal Applications

- Positioning
- Local, National & Regional Reference Frames: ARABREF is one example
- Navigation
- Surveying
- Precision Agriculture
- Land, Water & Territory Management
- Boundary Dispute
The UN-GGIM GGRF Initiative

• GGRF WG was established in 2013 to draft:
  – The text of a UN-GA resolution
  – A roadmap document

• The United Nation General Assembly Resolution (February 26, 2015) on the:
  Global Geodetic Reference Frame for Sustainable Development

• Creation of a UN-GGIM sub-committee on Geodesy for the implementation of the GGRF Roadmap
  – Contribution of UN-GGIM Regional entities is fundamental
VISION
An accurate, sustainable and accessible Global Geodetic Reference Frame to support science and society

- Geodetic Infrastructure
- Policies, Standards and Conventions
- Education, Training and Capacity building
- Appropriate Governance
- Outreach and Communication

Positioning geospatial information to address global challenges
UN-GGIM sub-committee

5 Focus groups for the Work Plan: Implementation of the roadmap recommendations:

1. Geodetic Infrastructure
2. Policy, Standards and Conventions
3. Education, Training and Capacity building
4. Outreach and Communication
5. Governance: a structure like:
   1. International Maritime Organization (IMO)
   2. International Hydrographic Organization (IHO)
How to contribute to the UN-GGIM Sub-committee on Geodesy?

The main two targets of the initiative are:

1. Ensure the sustainability of the GGRF
2. Give access to all countries to the GGRF

• Contribute to Target (1) by:
  – Sharing a fraction (%) of your geodetic data
  – Build a Core geodetic site if you have resources

• Take benefit of Target (2), i.e. Express your needs in terms of:
  – National geodetic infrastructure in order to access the GGRF
  – Capacity building in Geodesy
Current Distribution
UN-GGIM: Arab States
WG3 status and activities

Main target: Building the ARABREF
Two phases for building the ARABREF

• **Phase 1**: GNSS data analysis to build the geometric part of ARABREF
  – Proof of concept to start with

• **Phase 2**: physical geodesy data analysis of ARABREF vertical network (e.g. Geoid, gravity, leveling, tide gauges)
Benefits of an ARABREF?

- A unified Geodetic Reference Frame for all Arab countries
- Unification of geodetic/mapping applications within the Arab region, without need for transformation
- Interoperability of geospatial data exchanges and of multi-lateral geodetic/geospatial projects.
- Learning together on how to (1) accurately analyze GNSS data, (2) determine geodetic parameters, (3) use GNSS for scientific and societal applications
- ARABREF will be connected and consistent with the International Terrestrial Reference Frame (ITRF)
- You need to share data, knowledge, expertise and working together for the benefit of all
GNSS data explosion: ~15000 sites

Blewitt, 2015
Europe: EUREF Network

Positioning geospatial information to address global challenges
ITRF2014 Network: GNSS - Zoom
WG3 Work plan this week:

• Follow up of the recommendations and action items of WG3 meetings held in:
  – Riyadh, November 22-23, 2016
  – Doha 21-23, 2017

• Progress made by each MS, i.e. status of:
  – Setup of ARABREF Data and Analysis Centers
  – CORS stations part of the ARABREF network
  – Capabilities in GNSS processing, with some numerical examples if available.

• ARABREF Implementation:
  – Identify MS specific needs and blocking points
  – The way forward
• Approval of the need to establish ARABREF
• Coordination of MS contribution to ARABREF at the national level

• Approve the principle, importance and spirit of data sharing

• Define two phases for building the ARABREF:
  – Phase 1: GNSS data analysis of ARABREF CORS network
  – Phase 2: physical geodesy data analysis of ARABREF vertical network (e.g. Geoid, gravity, leveling, tide gauges)
Recommendations, Riyadh Meeting, Nov. 2016 (2/2)

• Proof of concept: Start with Phase I: GNSS data analysis for the ARABREF implementation
• Provide GNSS data (RINEX and metadata files) of at least 10%, with an appropriate distribution of the CORS network of each country
• Establish 2-3 Data Centers to store and archive GNSS CORS RINEX and metadata files with privilege access to all AS Members
• Establish at least 2-3 Analysis Centers for routine daily analysis of ARABREF CORS network, and should be extended to all Arab Member States
**ARABREF: Sharing GNSS CORS Data**
*Riyadh Meeting, Nov. 2016*

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of GNSS CORS</th>
<th>Data Center</th>
<th>Analysis Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>10</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Egypt</td>
<td>4 TBC</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Jordan</td>
<td>1</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Lebanon</td>
<td>1</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Morocco</td>
<td>4</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Oman</td>
<td>4</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Qatar</td>
<td>2</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Sudan</td>
<td>2</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>10</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tunisia</td>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Data Centers & Analysis Centers

**Data Center (مركز البيانات)**
- A cluster of servers where you store and archive GNSS data:
  - GNSS observations (RINEX files) and
  - GNSS metadata: a site log for each GNSS station
- Needs an IT personal (maybe one technician)

**Analysis Center (مركز التحليل)**
- A computer or a cluster of computers
- GNSS Precise software (Bernese, GAMIT, etc.)
- Scientist(s) to analyze GNSS data
- Able to process GNSS data in a routine mode (daily)
Doha Recommendations (1/2)

• WG3 Chair to prepare a letter to UN-GGIM AS members to solicit their support and contribution to the implementation of ARABREF, including:
  – The benefits and objectives of ARABREF
  – The importance of working together and sharing data, knowledge and expertise

• WG3 members are invited to continue their efforts for the implementation of Riyadh recommendations

• Member States with technical capabilities to start:
  – Establishing Data Centers
  – Sharing GNSS data for their selected CORS stations
  – Establishing Analysis Centers
Doha Recommendations (2/2)

• The selected GNSS CORS stations should adhere and satisfy the international standards, e.g. IGS

• Member States to acquire technical capabilities in GNSS processing
وشكرا لكم