

Common Coordinate System LRO PSWG Breakout Meeting Report

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Recorder: Brent Archinal &
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Common Coordinate System

- 1. TITLE SLIDE (with facilitator & recorder)**
- 2. LIST of CORE TEAM MEMBERS/PARTICIPANTS**
- 3. BACKGROUND PRESENTATIONS PROVIDED**
- 4. OPPORTUNITIES**
- 5. OBSTACLES**
- 7. OPTIONS** (for taking advantage of opportunities and overcoming obstacles to make progress)
- 8. IDEAS FOR COMMUNICATING OUR FINDINGS**

Common Coordinate System

ALL TEAM MEMBERS

- Maria Zuber (MIT)
- Brent Archinal (USGS/Astrogeology)
- Greg Neumann (GSFC)
- Koji Matsumoto (Nat Astron Obs Japan or NAOJ)
- Lisa Gaddis (USGS/Astrogeology)
- Christian Veillet (CFH Telescope, HI)
- Randolph Kirk (USGS/Astrogeology)
- Frank Lemoine (GSFC)
- Ashwin Vasavada (JPL)
- Charles Acton (JPL)
- Tye Brady (Draper Lab)
- David Everett (GSFC)
- Anton Sanin (IKI)
- Roger Clark (USGS, Denver)
- Hiroshi Araki (NAOJ)
- Helene Winters (JHU/APL)
- Virender Kumar (ISRO)
- Bernard Foing (ESA)
- Joe Boardman (AIG, not present)
- David Smith (NASA/GSFC)
- David Paige (UCLA)

Common Coordinate System

BACKGROUND PRESENTATIONS PROVIDED

- **Brent Archinal:** Lunar Coordinate Systems
 - Two common systems:
 - Mean Earth (ME)
 - Principal Axis (PA)
 - Clementine
 - Mean Earth System
 - $R = 1738$ km
 - Recommended for LRO (see white paper)
 - ME system for products, e.g. for PDS archive
 - PA system can be used internally
 - Longitude 0° to 360° East
 - ME orientation (specific frame) defined by JPL LE 403 & Euler rotations (and improved LE if/when available)
 - Reference surface not yet adopted
 - Radius of 1737.4 km recommended by IAU; not yet adopted
 - LPRP and Constellation will likely adopt these conventions
 - International missions? Don't know. Chandrayaan-1 may use $r=1738$ km? (unlike other missions)
 - Recommend immediate initiation of Lunar Geodesy and Cartography Working Group

Common Coordinate System

BACKGROUND PRESENTATIONS PROVIDED

- **Recommendations:** Lunar Coordinate System

- Unanimously recommend immediate initiation of Lunar Geodesy and Cartography Working Group
 - Use Mars Geodesy Working Group as model
 - Sponsored by NASA (Chair time, some small amt of travel paid by NASA)
 - Include international participation.
 - Make recommendations as need arises.
 - Create readily available web site as clearing house for participants and non-participants
- Recommended for LRO (see white paper)
 - ME system for products, due to historical use in most (all?) previous cartographic datasets
 - PA system can be used internally
 - Longitude 0° to 360° East
 - ME orientation (specific frame) defined by JPL LE 403 & Euler rotations (and improved LE if/when available)
 - Reference surface not yet adopted
- LPRP and Constellation will likely adopt these conventions
- International missions? Chandrayaan-1 may use $r=1738$ km (unlike other missions)
- Study the possibility of adding retroreflector(s) to LRO in order to use LLR observations to tie LLR and LRO reference frames. Future orbital and lander missions of extended length should have similar retroreflectors for the same reason.
- Consider setting up some sort of local time system – for e.g. monitoring lunar illumination changes. [Added here 2006.12.04.]
- Products should be well documented as to the coordinate system, frame, constants, time system, etc. used.

Common Coordinate System

OPPORTUNITIES

- If we use a common coordinate system, it will be much more straightforward to use data from different missions to (e.g.) densify control and digital elevation models.
- Use of a common coordinate system and shape model will increase the value of all the data sets.

Common Coordinate System OBSTACLES

- Some sort of local time system – for e.g. monitoring lunar illumination changes – needs to be set up.
- Noting/understanding the difference between the ME and PA systems.
- Not sure of which organization(s) to make recommendations to. Who at NASA should own this and champion it?
 - How should discussion be continued until this issue is resolved?
 - LRO Project can ‘own’ this for now, with Brent Archinal (USGS--- barchinal@usgs.gov) and Gordon Chin as POC?
 - PLEASE add your name to email distribution list if you want to be involved in this discussion before, during, and after initiation of the WG
- Foing replayed experience with SMART-1 on how essential positional knowledge is...

Common Coordinate Systems

IDEAS FOR COMMUNICATING OUR FINDINGS

- Pass information on to NAC, Constellation Program, LPRP, LHAT, international missions
 - LPRP/Plescia has passed upward to Program Office, administrative issues with Constellation?
- Collect reactions to this information and update with a similar meeting at the next LRO PSWG and as needed until a LGCWG is established.
- Start a web site that contains existing information (e.g. the LRO white paper, results from this meeting)