PDS Cartography and Imaging Sciences Node

Jet Propulsion Laboratory U.S. Geological Survey

Europa Mission

Lisa Gaddis (USGS, Astrogeology)

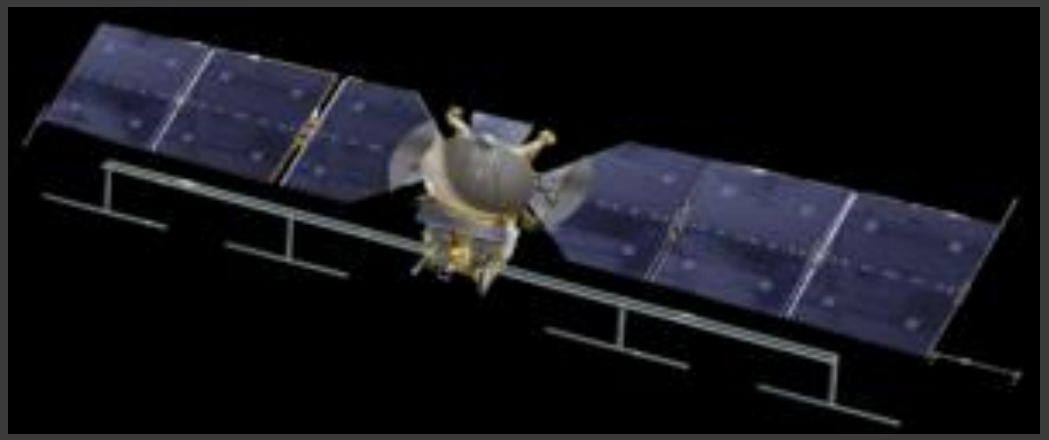
PDS Cartography and Imaging Sciences Node

(You can still call us "Imaging" or PDS-IMG or IMG)

Feb 5, 2016

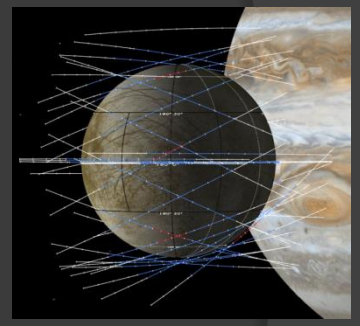
Europa Mission Interface

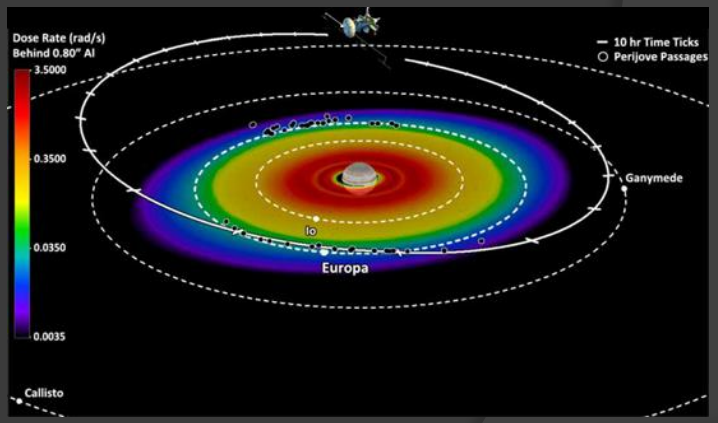
- Mission Status
- Instruments
- PDS Current Status:
  - Node Assignments
    - Identify Lead Node, Instrument Support Nodes



Europa Mission

- Now called “Europa Multiple Flyby Mission”
- Europa Clipper Orbiter *and a Lander*
- Explores potential for subsurface ocean & habitability on Jupiter’s moon Europa
  - Ice shell and ocean, composition, geology
- Performs *45* close flybys of Europa from orbit around Jupiter
  - Topographic survey, ice thickness, plumes?
  - 7 to 10 days to transmit data between flybys
- Solar powered
- Joint investigation between JPL & APL
- Nine instruments on orbiter
- Nanosatellites for plume samples?
- Lander configuration is TBD





Europa Clipper Orbital Instruments

- PIMS: Plasma Instrument for Magnetic Sounding
  - *PI: Joseph Westlake, APL*
- ICEMAG: Interior Characterization of Europa using Magnetometry
  - *PI: Carol Raymond, JPL*
- MISE: Mapping Imaging Spectrometer for Europa
  - *PI: Diana Blaney, JPL*
- EIS: Europa Imaging System
  - PI: Elizabeth Turtle, APL
- REASON: Radar for Europa Assessment and Sounding: Ocean to Near-Surface
  - PI: Donald Blankenship, Univ. Texas
- E-THEMIS: Europa Thermal Emission Imaging System
  - PI: Philip Christensen, Arizona State Univ.
- MASPEX: Mass Spectrometer for Planetary Exploration/Europa
  - PI: Jack Waite, Southwest Research Institute
- UVS: Ultraviolet Spectrograph/Europa
  - PI: Kurt Retherford, SWRI
- SUDA: Surface Dust Mass Analyzer
  - PI: Sascha Kempf, Univ. Colorado, Boulder

EMF Mission: Lander

- Still under development
- Europa Clipper Orbiter would image the surface over 3 years (95% coverage, 50 m/pixel) to help identify a landing site
- 1-Meter in diameter, 230 kg, 30 kg for instruments
- Possible instruments:
  - Mass spectrometer
  - Raman spectrometer
- Sky crane landing system?
- 10 days of surface operations (battery power)
  - Active crevasse site?

EMF Mission: Notional Timeline (?)

- Still under assessment
  - Atlas V 551 rocket >> 6 years transit time
  - Space Launch System (SLS) >> 3 years transit time
- Launch 2022 to 2025 (in ~6 to 9 years)
- Mission duration: 3 to 5 years?

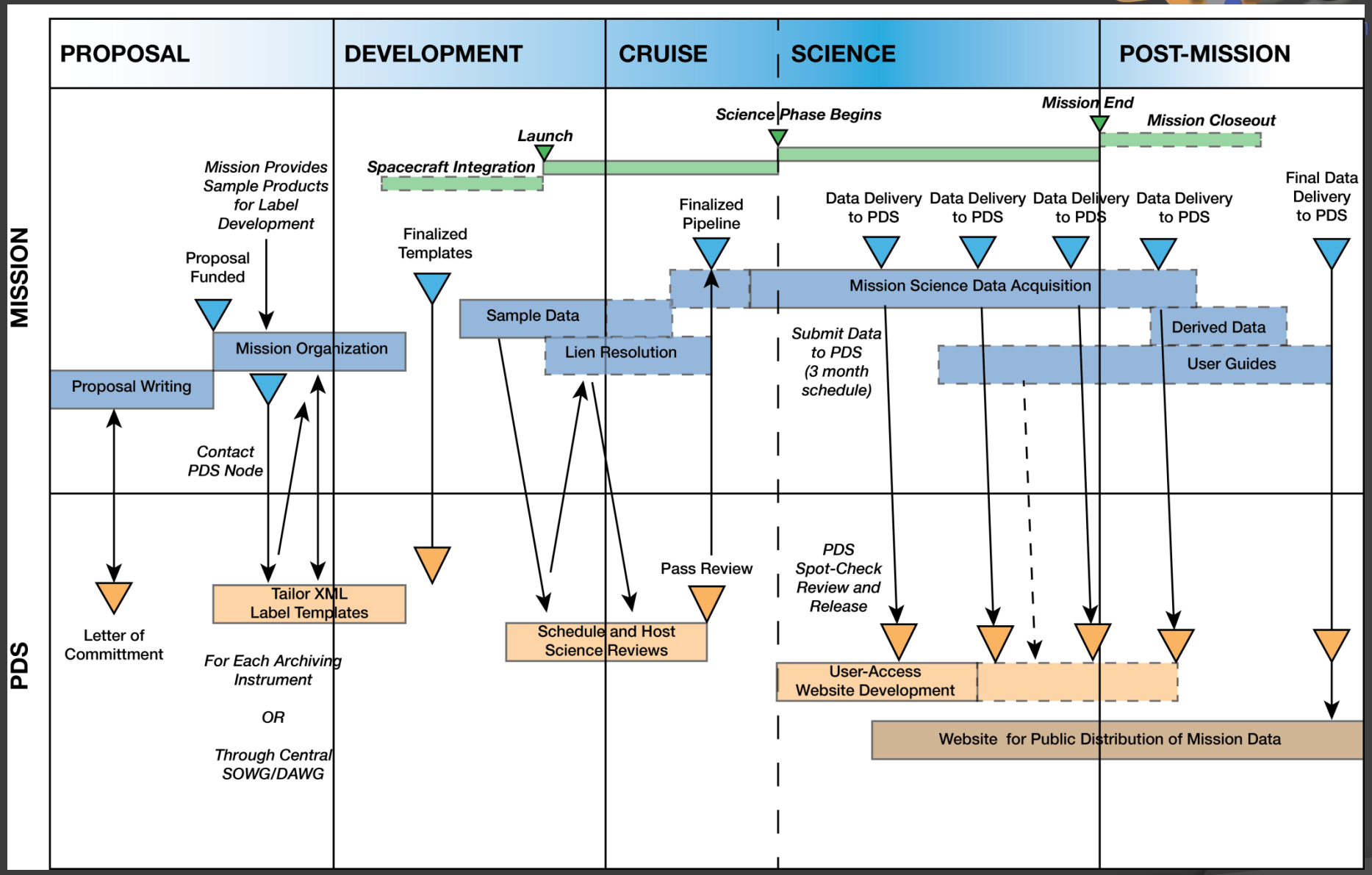
EMF Mission: TBD for PDS

- Identify Lead Node
- Assign Instrument Nodes
- Draft schedule, contact Pappalardo (JPL)
- Establish DAWG, move into archive operations

EMF Instruments & PDS Nodes

Instrument	PI	Description	Assigned Node
Plasma Instrument for Magnetic Sounding (PIMS)	Joseph Westlake (APL)	Works with magnetometer; key to determining ice shell thickness, ocean depth and salinity by correcting magnetic induction signal for plasma currents around Europa	PPI
Interior Characterization of Europa using Magnetometry (ICEMAG)	Carol Raymond (JPL)	Magnetometer to measure magnetic field near Europa and (with PIMS) infer location, thickness, salinity of subsurface ocean	PPI
Mapping Imacing Spectrometer for Europa (MISE)	Diana Blaney (JPL)	Hyperspectral imaging spectrometer to map composition of Europa (organics, salts, acid hydrates, water ice phases, etc.) to assess habilitability of Europa	GEO
Europa Imaging System (EIS)	Elizabeth Turtle (APL)	Wide and narrow angle cameras to map most of Europa at 50 meter resolution, with 5 cm images of selected sites	IMG
Radar for Europa Assessment and Sounding: Ocean to Near-Surface (REASON)	Donald Blankenship (UT, Austin)	Dual-frequency ice-penetrating radar instrument to characterize icy crust.	GEO
Europa Thermal Emission Imaging System (E-THEMIS)	Philip Christensen (ASU)	Thermal imaging spectrometer to acquire multi-spectral therm imaging to detect actives sites (e.g., eruptions)	IMG
Mass Spectrometer for Planetary Exploration/Europa (MASPEX)	Jack (Hunter) Waite (SwRI, San Antonio, TX)	Atmospheric measurements to determine composition of surface and subsurface ocean	ATM
Ultraviolet Spectrograph/Europa (UVS)	Kurt Retherford (SwRI)	UV spectral measurements of surface and near-surface (atmosphere) to detect eruptions of water	ATM
Surface Dust Mass Analyzer (SUDA)	Sascha Kempf (UC, Boulder)	Measures the composition of small, solid particles ejected from Europa.	SBN
TECH DEVELOPMENT: Space Environmental and Composition Investigation near the Europan Surface (SPECIES)	Mehdi Benna (NASA GSFC)	Neutral mass spectrometer, gas chromatograph	?

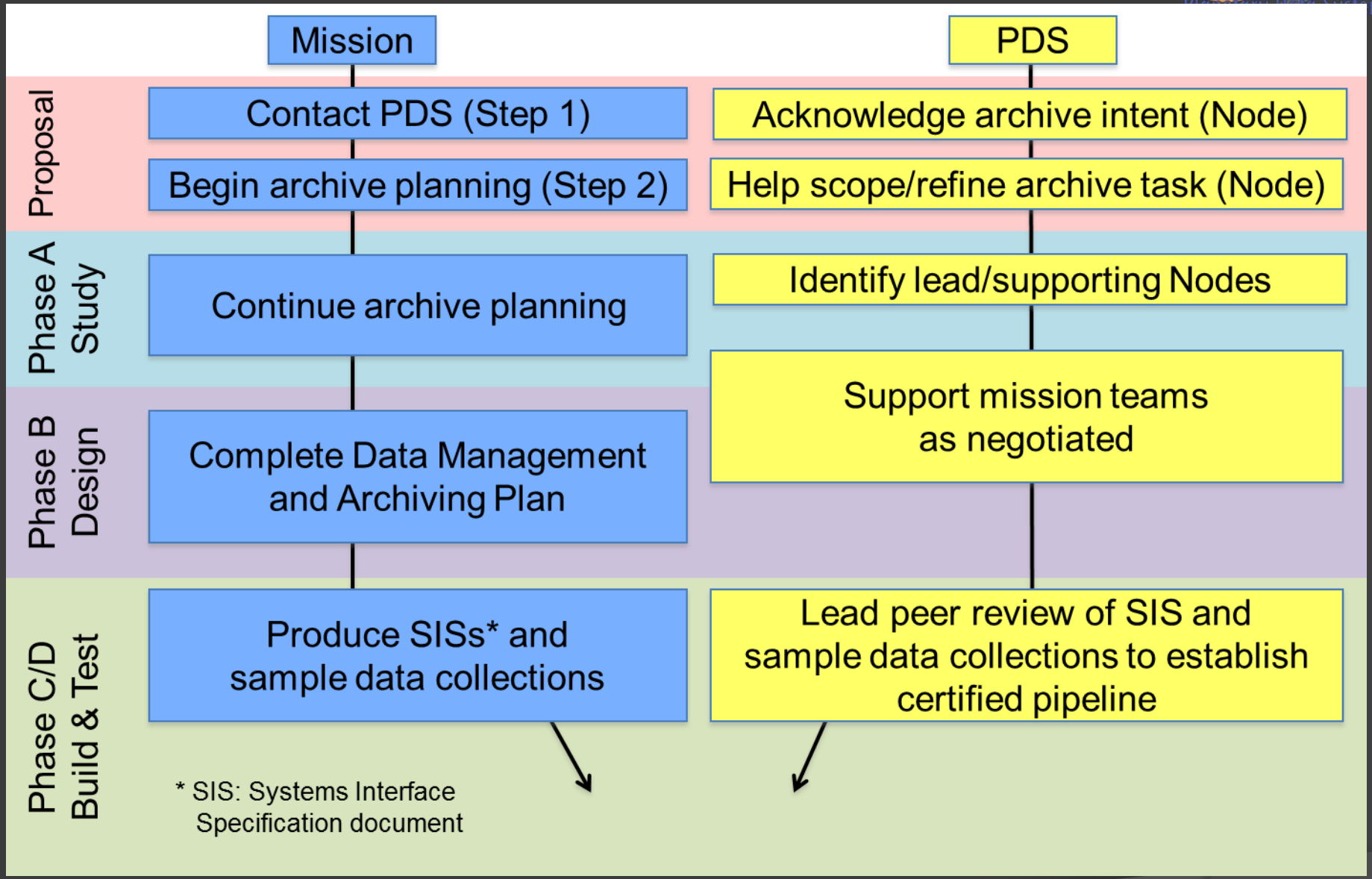
Typical Mission & PDS Timeline



Mission: Proposed Archiving Schedule

Now (Current date)	Start DAWG meetings Start draft of Archive Plan Start drafts of ICDs
Mission PDR (Date, ~1.5 yrs later)	Preliminary DMAP (Archive Plan) completed Draft ICD for each instrument completed E2E Peer Review??
Mission CDR (Date, ~1 yr later)	Final Archive Plan completed Final ICDs completed Draft SIS documents completed Start peer reviews of instrument data products
Launch minus 6 months (Date, ~2 yrs later)	Final SIS documents completed Peer reviews complete
Launch (Date, ~2 yrs later)	
TBD	First data acquisition period – 30 days or 3 months
TBD	First data release – end of data acquisition + 3 months (Meets Level 1 reqt to archive data in <6 months after receipt)
TBD	Subsequent releases – every 3 months

PDS Archive Process



PDS Archive Process