MODIS
ASTER

Solar illumination angles
Variable look angles
Fields-of-view
Complements satellite imagery

Benefits of Astronaut Photography
What we do: Mission Operations

Bodele Depression Dunes, Chad

Viedma Glacier, EEAB Program

Wildfires near Sydney, Australia, IDC

IMAX
A BEAUTIFUL PLANET
EXPERIENCE EARTH LIKE NEVER BEFORE
What we do: Astronaut Training
Human Impacts

Three Gorges Dam, Yangtze River
Glaciers

Patagonian Ice Fields
Urban Areas

Chicago at night
We also train and study

Planetary analogues

Deltas and coasts

Impact Craters

Geography

Aerosols
What we do: Geographic Information Science
Remote Sensing
What we do: Planetary Analogs

NEEMO

Navy Postgraduate School

Shark Marine
Drifter Project

NASA JSC/Jacobs Drifter Data
Armand Bayou Nature Center
What we do: Data Distribution

Gateway to Astronaut Photography of Earth

Earth Science & Remote Sensing Unit

Earth Observatory

Google Earth NASA layer
Aurora Borealis

Yukon Territory

British Columbia

ISS030-E-115050
Morocco at night

Morocco area

ISS044-E-47820
Atlantic Ocean from the Cupola
ISS Night Compilation

Videos produced by the Crew Earth Observations group at NASA Johnson Space Center

For replication and crediting information, please see our guidelines on our main video page.
USING ASTRONAUT IMAGERY IN ACTIVITIES FOR FORMAL AND/OR INFORMAL VENUES

1. Blue Marble Matches

2. Image Detective 2.0
USING ASTRONAUT IMAGERY IN ACTIVITIES FOR FORMAL AND/OR INFORMAL VENUES

1. Blue Marble Matches Activity
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

1. INTRODUCE IMAGERY TO PARTICIPANTS:
   *Listen to an image description & try to identify the image being described.*
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

2. PAIR IMAGES THAT REPRESENT THE SAME GEOLOGIC PROCESS:  (wind, water, impact, volcanic)
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

2. PAIR IMAGES THAT REPRESENT THE SAME GEOLOGIC PROCESS: (wind, water, impact, volcanic)

Example: Images 3 & 8 represent the Impact process

Impact  Volcanic  Water  Wind
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

2. PAIR IMAGES THAT REPRESENT THE SAME GEOLOGIC PROCESS: (wind, water, impact, volcanic)
Example: Images 3 & 8 represent the Impact process
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

3. DEVELOPING IDENTIFICATION CRITERIA: (wind, water, impact, volcanic)

Aeolian (Wind)  Fluvial (Water)  Impact  Volcanic
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

4. MATCHING IMAGERY AND IDENTIFICATION CRITERIA: EARTH

EARTH IMAGERY & IDENTIFICATION CRITERIA

1) Place each image card under its associated geologic process.
2) Put associated key words & FEATURE NAME cards under each image.
**BLUE MARBLE MATCHES**

*Using Earth for Planetary Comparisons*

# 4. MATCHING IMAGERY AND IDENTIFICATION CRITERIA: EARTH

**EARTH IMAGERY & IDENTIFICATION CRITERIA**

1. Place each image card under its associated geologic process.
2. Put associated **key words & FEATURE NAME** cards under each image.

<table>
<thead>
<tr>
<th>PROCESS</th>
<th>FLOW</th>
<th>WATER</th>
<th>VOLCANIC</th>
<th>IMPACT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND DUNES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANNEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAVA FLOW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EARTH IMAGERY & IDENTIFICATION CRITERIA**

1. Place each image card under its associated geologic process.
2. Put associated **key words & FEATURE NAME** cards under each image.
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

4. MATCHING IMAGERY AND IDENTIFICATION CRITERIA: MARS

MARS FEATURE IMAGES
1) Use Earth based criteria to help you decide what process/feature is represented in each image.
2) Write KEY WORDS & FEATURE on blue card & place under corresponding image.

<table>
<thead>
<tr>
<th>WORD</th>
<th>WATER</th>
<th>VOLCANIC</th>
<th>IMPACT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Criteria (key words):
1. Entire Structure
2. Cone shaped, looks raised

Feature: Volcano

Level of Confidence: 3
(1 = low, 3 = very confident)
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons

4. MATCHING IMAGERY AND IDENTIFICATION CRITERIA: PLUTO

PLUTO FEATURE IMAGES
1) Use Earth based criteria to help you decide what process/feature is represented in each image.
2) Write KEY WORDS & FEATURE on blue card & place under corresponding image.

Criteria (key words):
1. Entire Structure
2. Cone shaped, looks raised

Feature: Volcano

Level of confidence: 3
(1 = low, 5 = very confident)
BLUE MARBLE MATCHES
Using Earth for Planetary Comparisons
IMAGE DETECTIVE 2.0
CosmoQuest Citizen Science Project
(Currently being tested!)

STEP 1: SELECT AN IMAGE
IMAGE DETECTIVE 2.0
CosmoQuest Citizen Science Project

**TASK #1:**
DECIDE WHAT PERCENT OF THE IMAGE IS COVERED BY CLOUDS

(click on the “?” for additional information)
TASK #2: SELECT FEATURES VISIBLE IN THE IMAGE
(click on the “?” for additional information)
TASK #3: IDENTIFY THE CENTER POINT OF THIS IMAGE ON EARTH
IMAGE DETECTIVE 2.0
Identifying the Center Point of an Image on a Map of Earth

**TIP #1:**
- Initial starting location is where the ISS was located above the Earth when the image was taken.
IMAGE DETECTIVE 2.0
Identifying the Center Point of an Image on a Map of Earth

TIP #2:
- Zoom in or out of map
- Try to match up what you are seeing in the photo with features on the map (pattern matching).
TIP #3:

- Once you have found an area where you think features match, use the Transparency, Rotation, and Scale sliders to help you verify the match.
- You will want to match up the SIZE, LOCATION, and ORIENTATION of the image with the map.
TIP #4:
• Once you have used the **Transparency, Rotation, and Scale** sliders to successfully match up the **SIZE, LOCATION**, and **ORIENTATION** of the image with the map, click “FOUND IT”.

**IMAGE DETECTIVE 2.0**

*Identifying the Center Point of an Image on a Map of Earth*
USING ASTRONAUT IMAGERY IN ACTIVITIES FOR FORMAL AND/OR INFORMAL VENUES

1. Blue Marble Matches
   https://ares.jsc.nasa.gov/interaction/eeab/blue-marble-matches.html

2. Image Detective 2.0
   Interested in becoming a beta-tester? Contact: beta@cosmoquest.org
Questions?