



Off Kilter: Assets of Oblique Satellite Views

12th Mountain Cartography Workshop



Snow Mountain Ranch, Colorado • February 26, 2020



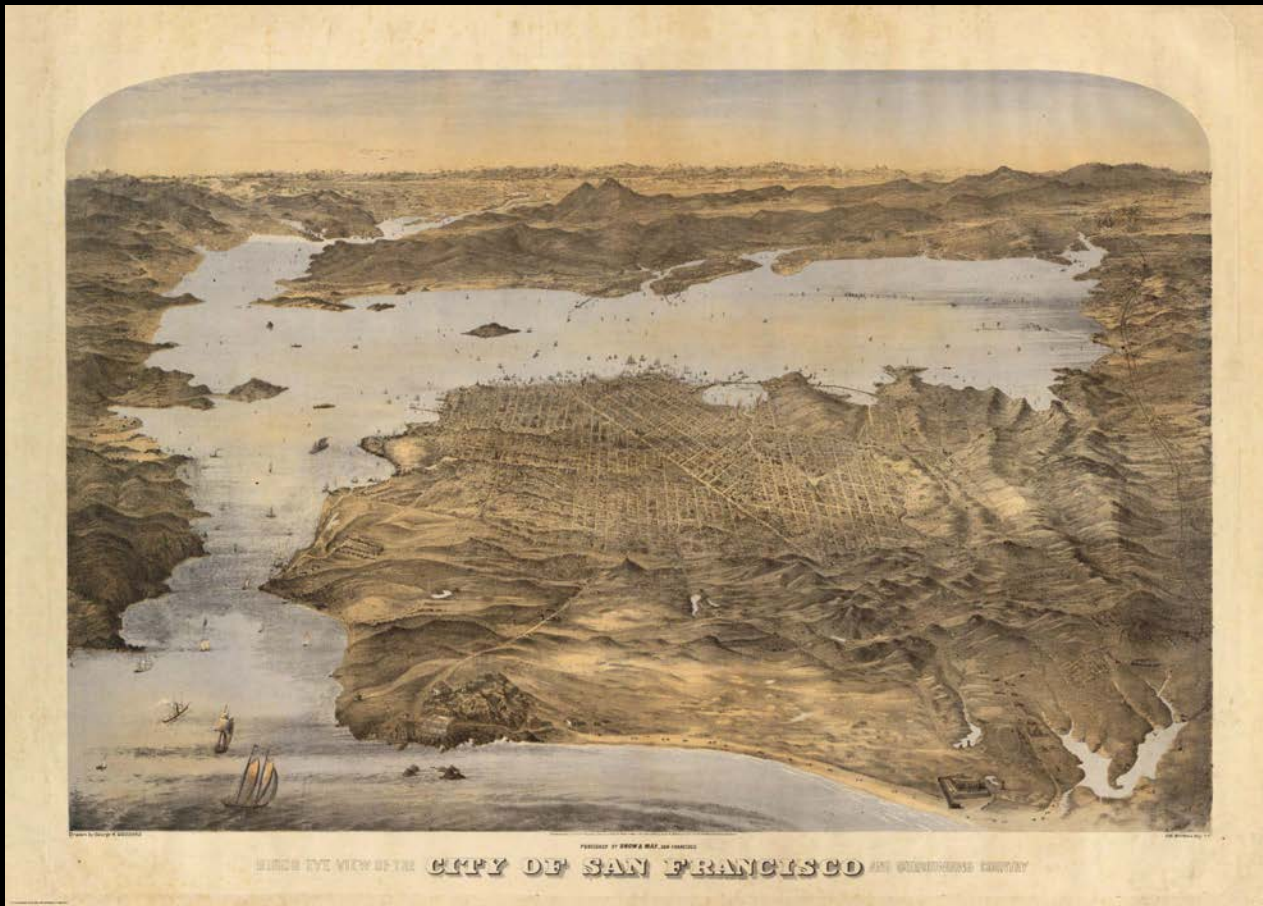
GOOGLE MAPS SATELLITE VIEW





WORLDVIEW-3, MAXAR · San Francisco, CA · February 7, 2016

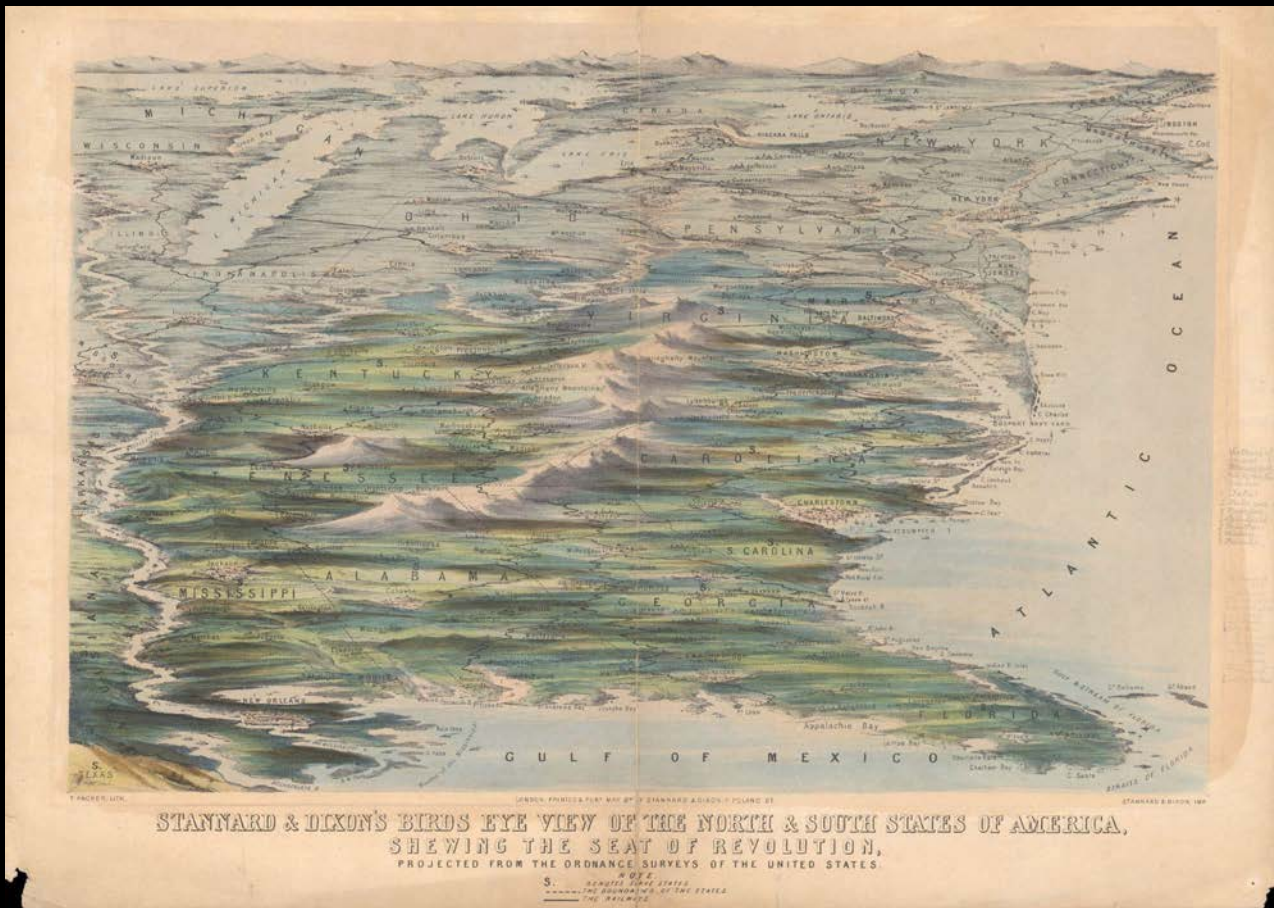




BIRDS EYE VIEW OF THE CITY OF SAN FRANCISCO AND GOLDEN-GATE COUNTRY

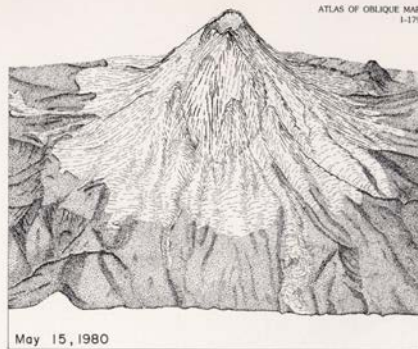
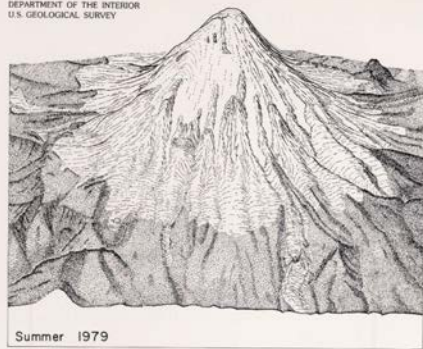
BIRDS EYE VIEW OF THE CITY OF SAN FRANCISCO... · 1868



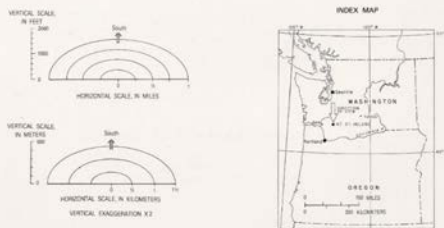
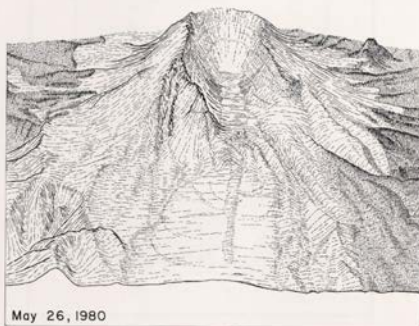


BIRDS EYE VIEW OF THE NORTH & SOUTH STATES OF AMERICA · 1861





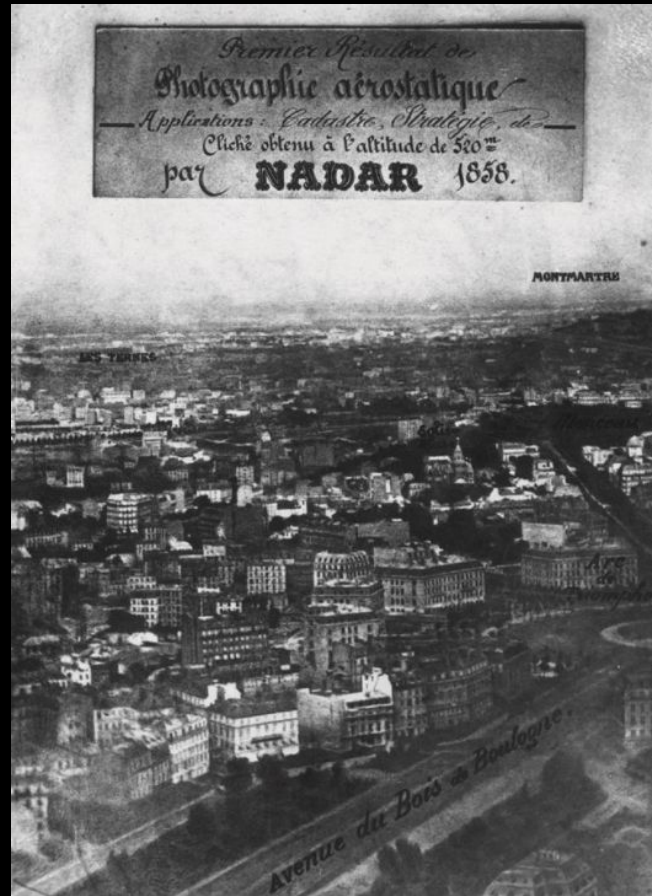
44



The view is toward the south in these three oblique maps of Mount St. Helens. The first represents the volcano in the summer of 1979 before the volcanic activity became visible. The second portrays the volcano on May 15, 1980, two days before the eruption. The summit plateau center is crater formed by the explosion of steam, mud, or other material due to the heating and consequent expansion of water by an underlying hot source and the extent of the growing ledge are emphasized (Blaisdell and Cooke, 1982, p. 22). On May 18, 1980, Mount St. Helens erupted, devastating an area of 252 square miles (660 square kilometers). The third oblique map depicts the volcano eight days after the eruption. As each contour map did not exist on May 26, 1980, this oblique map represents syntheses accounts by geologists working on the volcano and slide accounts, usually in the form of newspaper pictures. The third map was completed in a short span of time, and four maps were on display during President Carter's briefing and tour of the devastated area. The map has been published in Alpha, Moore, and Jones (1980a, b, c).

SEQUENTIAL PHYSIOGRAPHIC DIAGRAMS OF MOUNT ST. HELENS, WASHINGTON 1979-80

By
Tau Rho Alpha, James G. Moore, and David R. Jones
1980



PARIS, FRANCE · Nadar · 1858



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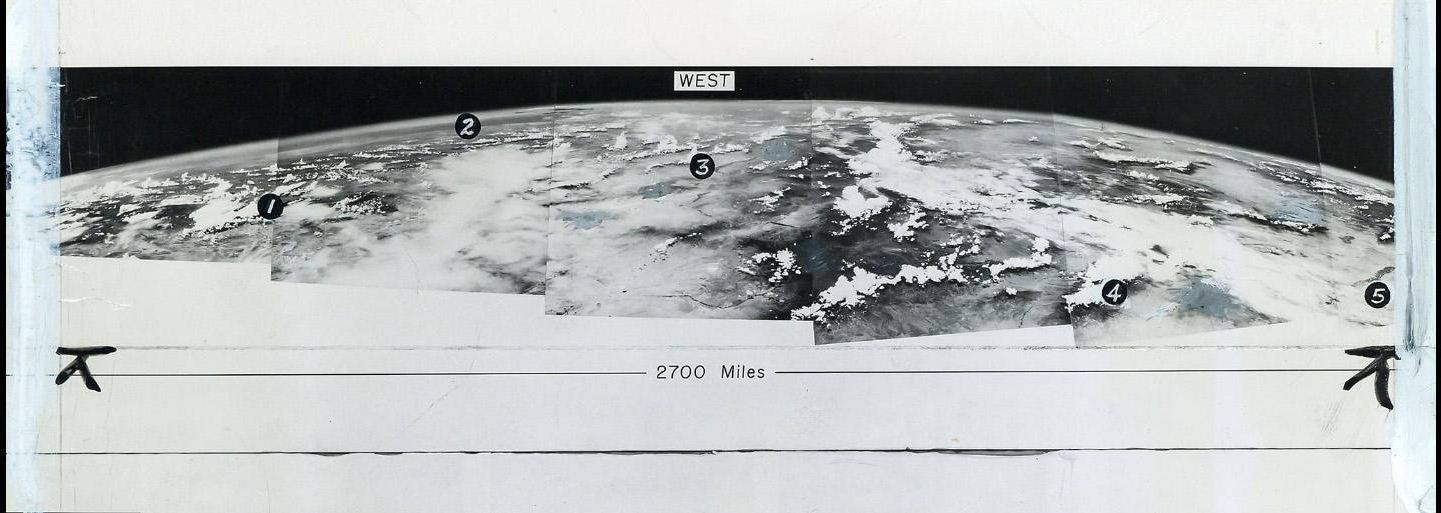
SAN FRANCISCO IN RUINS · May 5, 1906 · Library of Congress





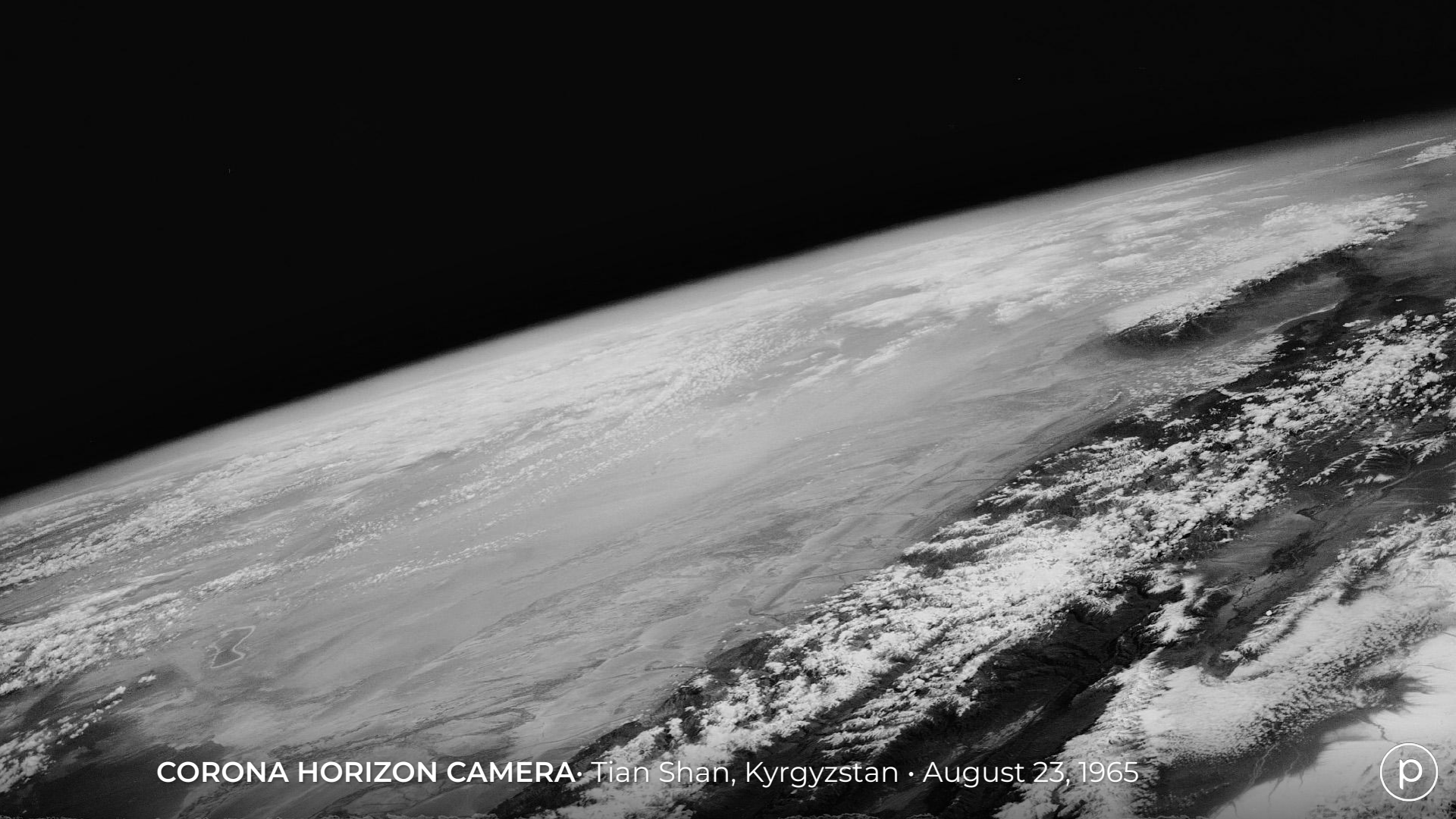
SOUTH DAKOTA · Explorer II · November 11, 1935





EARLY PHOTOS FROM SPACE · White Sands, NM · October 24, 1946





CORONA HORIZON CAMERA · Tian Shan, Kyrgyzstan · August 23, 1965





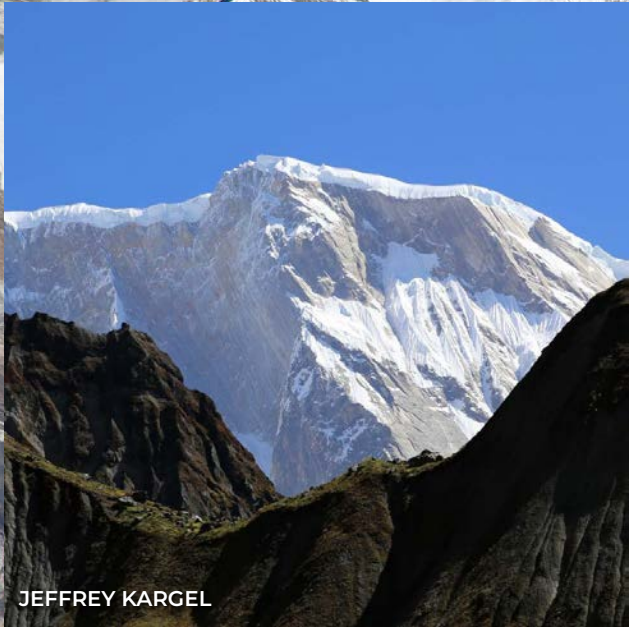
DHAULAGIRI · Tibet & Nepal · March 11, 2001





INTERNATIONAL SPACE STATION · Andes Mountains · June 21, 2021





JEFFREY KARGEL

ANNAPURNA IV · Nepal · December 22, 2013





INTERNATIONAL SPACE STATION · Sarychev Volcano · NASA · June 12, 2009





Our mission

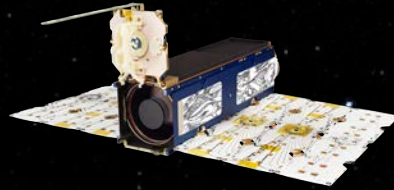
To image the whole world every day, making change **visible, accessible, and actionable.**



Planet's industry-leading constellations

~180

Dove Satellites



Doves



SATELLITES
~180

RESOLUTION
4 m

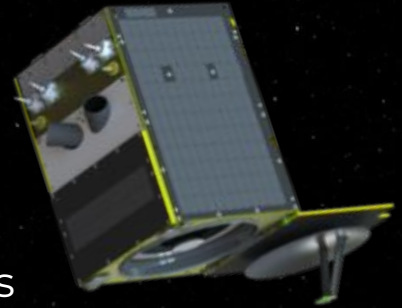
CAPACITY
300 million km²/day

ORBIT ALTITUDE
~525 km

8 SPECTRAL BANDS
**Coastal Blue, Blue,
Green I, Green II
Yellow, Red, Red Edge,
Near-Infrared**

21

SkySat Satellites



SkySat



SATELLITES
21

RESOLUTION
0.5 m

CAPACITY
4,000 targets/day

ORBIT ALTITUDE
450 km

SPECTRAL BANDS
RGB, PAN and NIR





Planet Dove Satellite

- Always-on, broad-area monitoring
- 3 meter resolution
- RGB and NIR bands





QUEEN MAUD LAND · Antarctica · January 9, 2023





BURN SCAR & DEBRIS FLOW · Montecito, CA · January 12, 2018





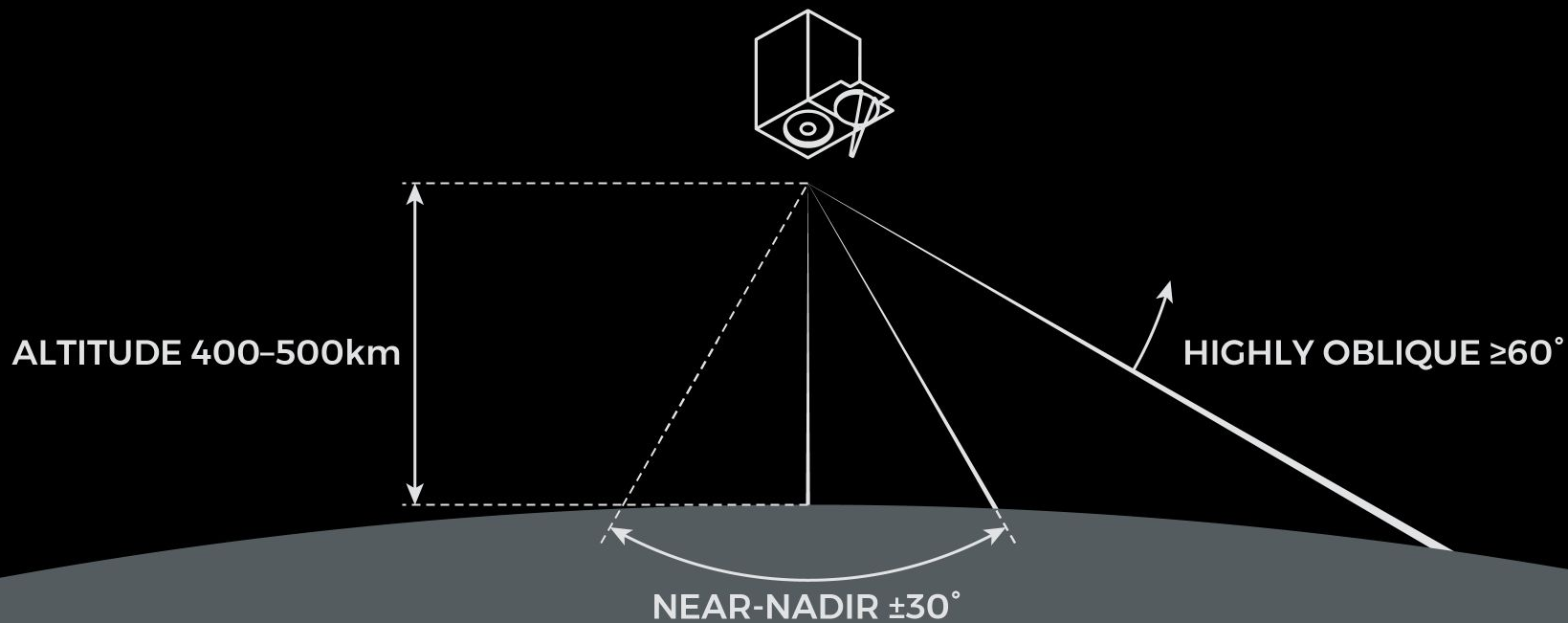
BURN SCAR & DEBRIS FLOW · Montecito, CA · January 27, 2018





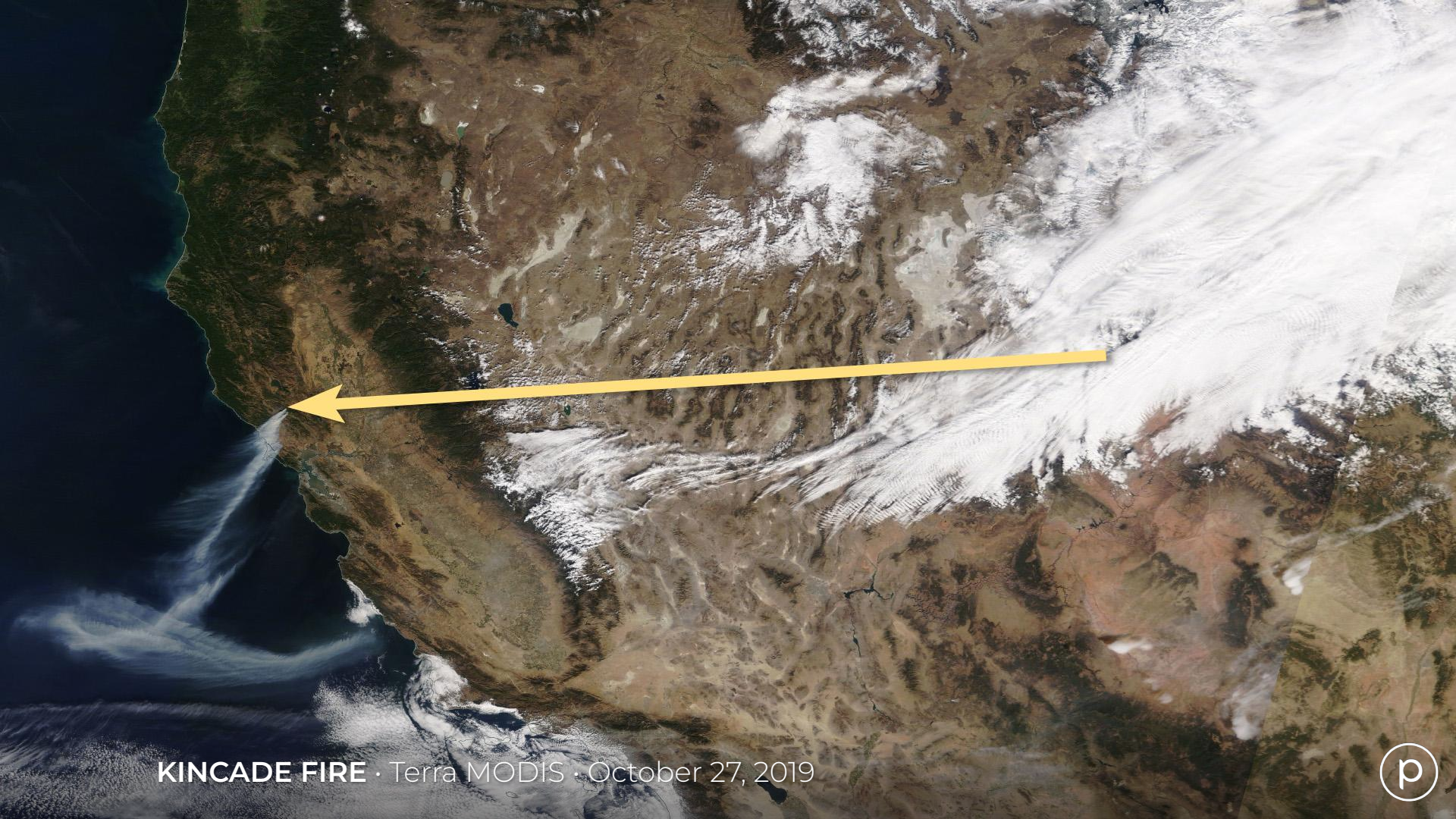
KINCADE FIRE · Sonoma County, California · October 27, 2019





SKYSAT COLLECTION GEOMETRY





KINCADE FIRE · Terra MODIS · October 27, 2019





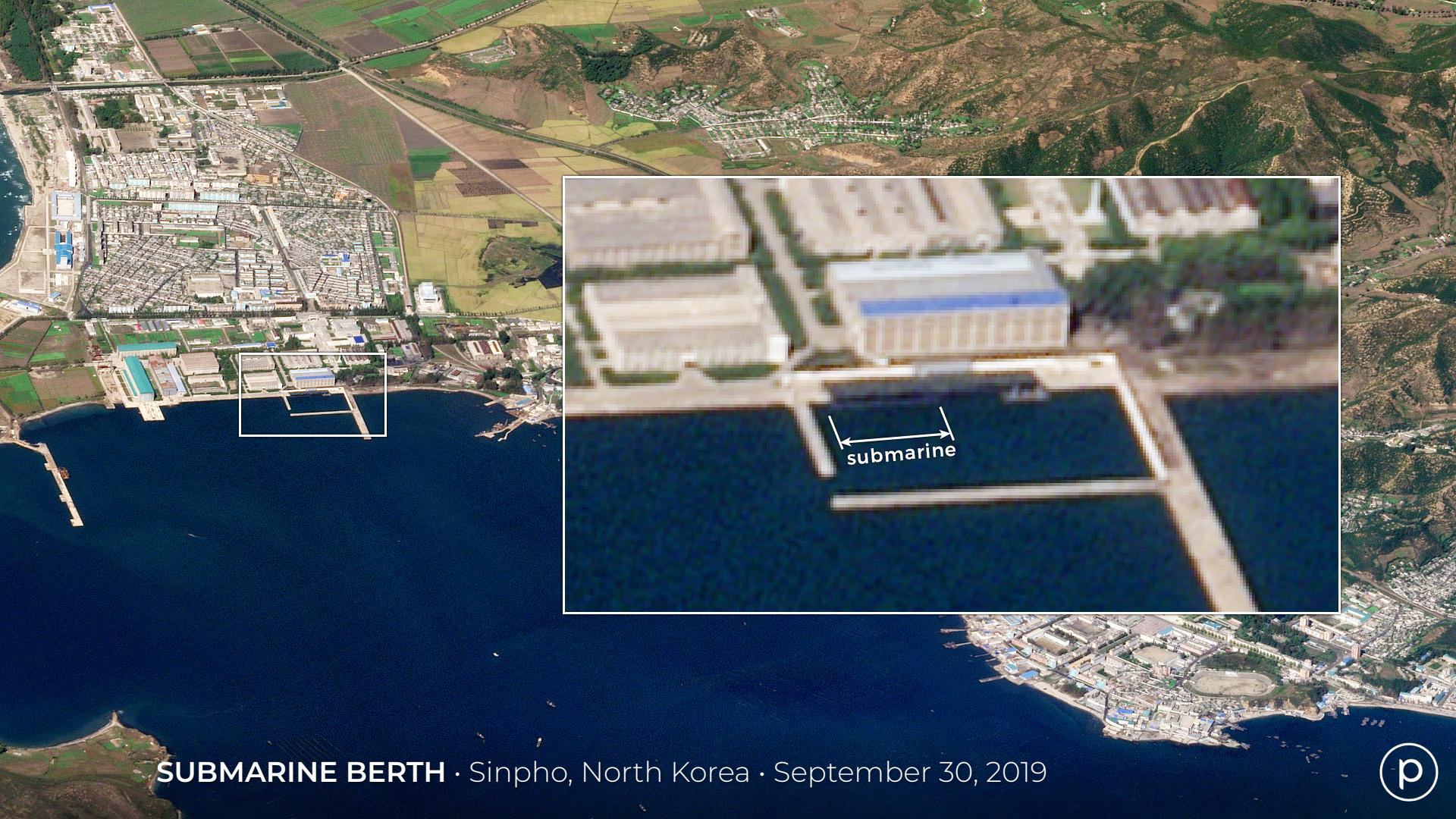
DOWNTOWN HOUSTON · Harris County, Texas · April 1, 2020





DOWNTOWN HOUSTON · Harris County, Texas · April 1, 2020





SUBMARINE BERTH · Sinpho, North Korea · September 30, 2019





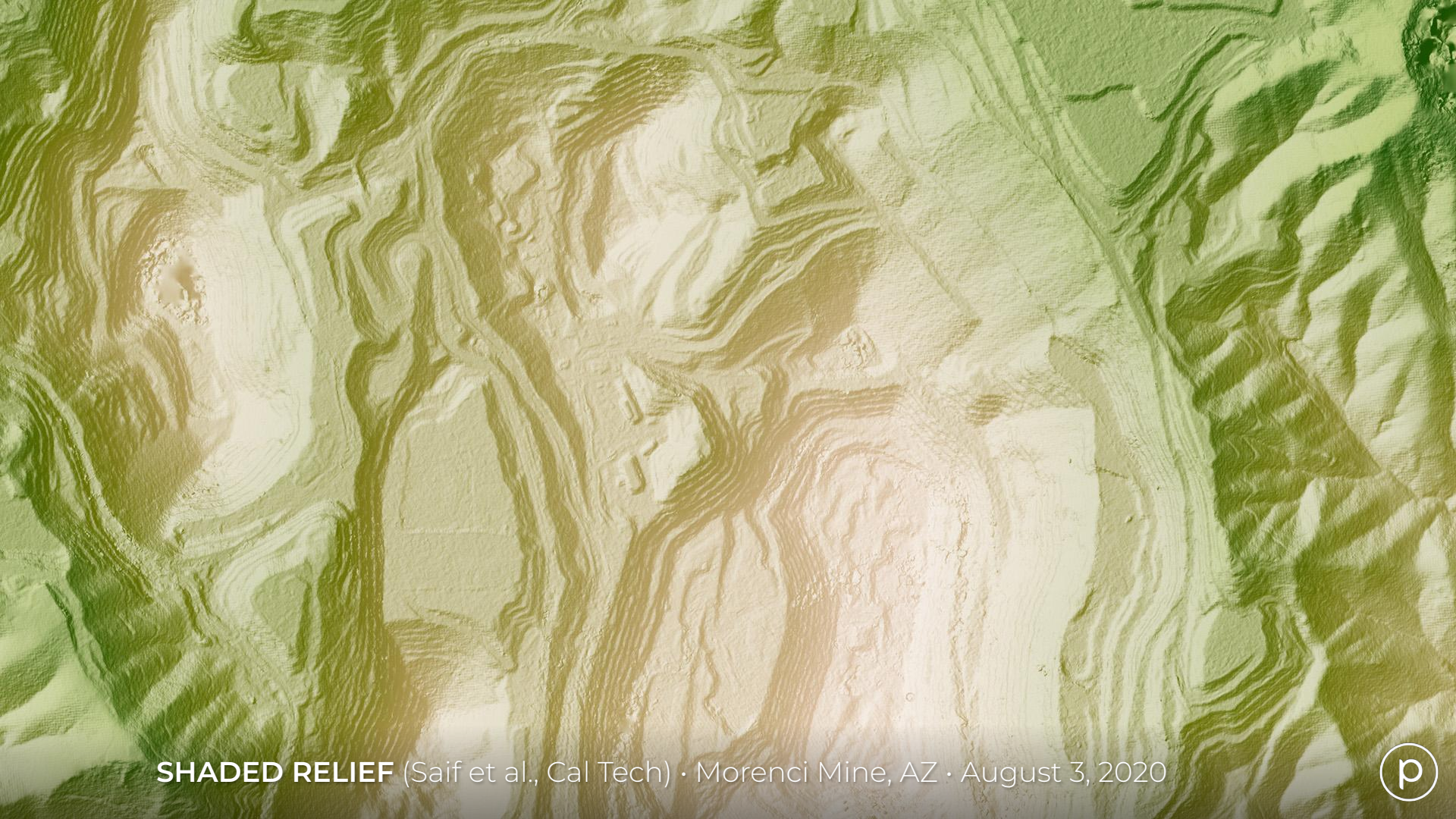
KINGS CANYON NATIONAL PARK · California · July 21, 2022





KINGS CANYON NATIONAL PARK DETAIL · California · July 21, 2022





SHADED RELIEF (Saif et al., Cal Tech) · Morenci Mine, AZ · August 3, 2020





BRECKENRIDGE, COLORADO · November 7, 2018

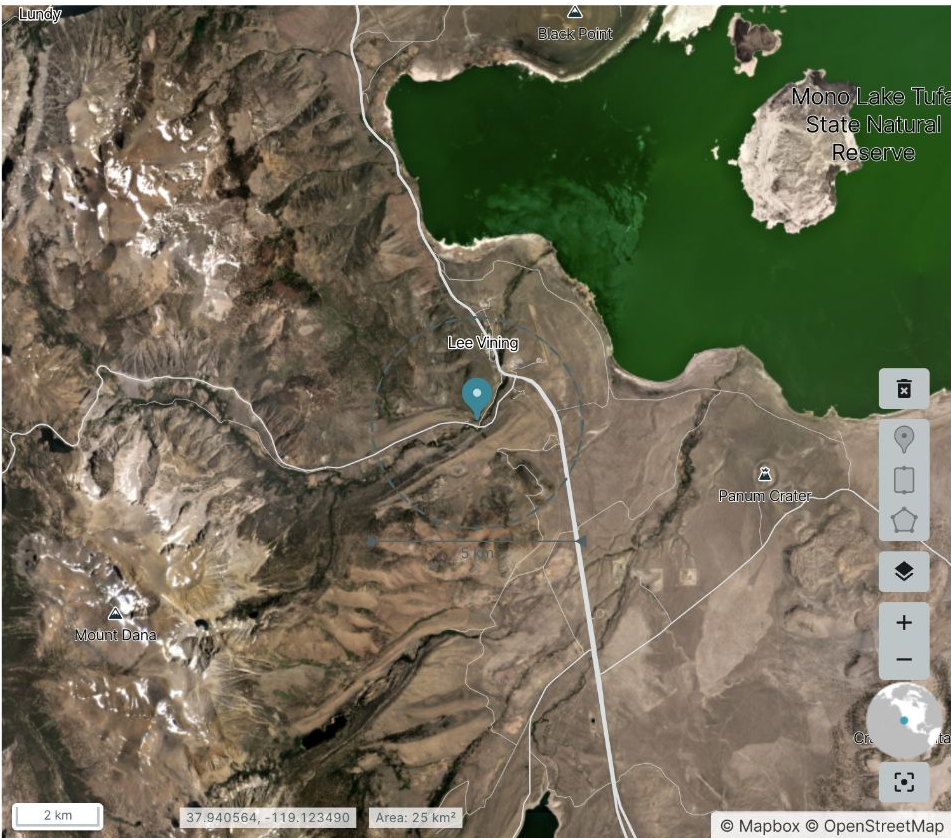




LAVA FALLS · Grand Canyon, Arizona · October 12, 2019



Create an order



ANGLES ^

Off-nadir: 55° - 59° (Satellite elevation: 24° - 29°)

Minimum Off-Nadir: °
 Maximum Off-Nadir: °

The input values reduce the imaging opportunities and the high view angles can lead to image processing failures.

Satellite azimuth: 45° - 100°

Minimum Sat. Azimuth: °
 Maximum Sat. Azimuth: °

Solar zenith: 0° - 85°

Minimum Solar Zenith: °
 Maximum Solar Zenith: °

Solar azimuth: 0° - 360°

Cancel



Daily Scenes

Libertad, Venezuela

Filter Dates Save search

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March 3, 2023

SkySat Scene

0.5m/px 39% Unrectified assets

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February 26, 2023

SkySat Scene

0.5m/px 1% Unrectified assets

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February 3, 2023

SkySat Scene

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SkySat Scene

0.5m/px 5% Unrectified assets

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January 31, 2023

SkySat Scene

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January 29, 2023

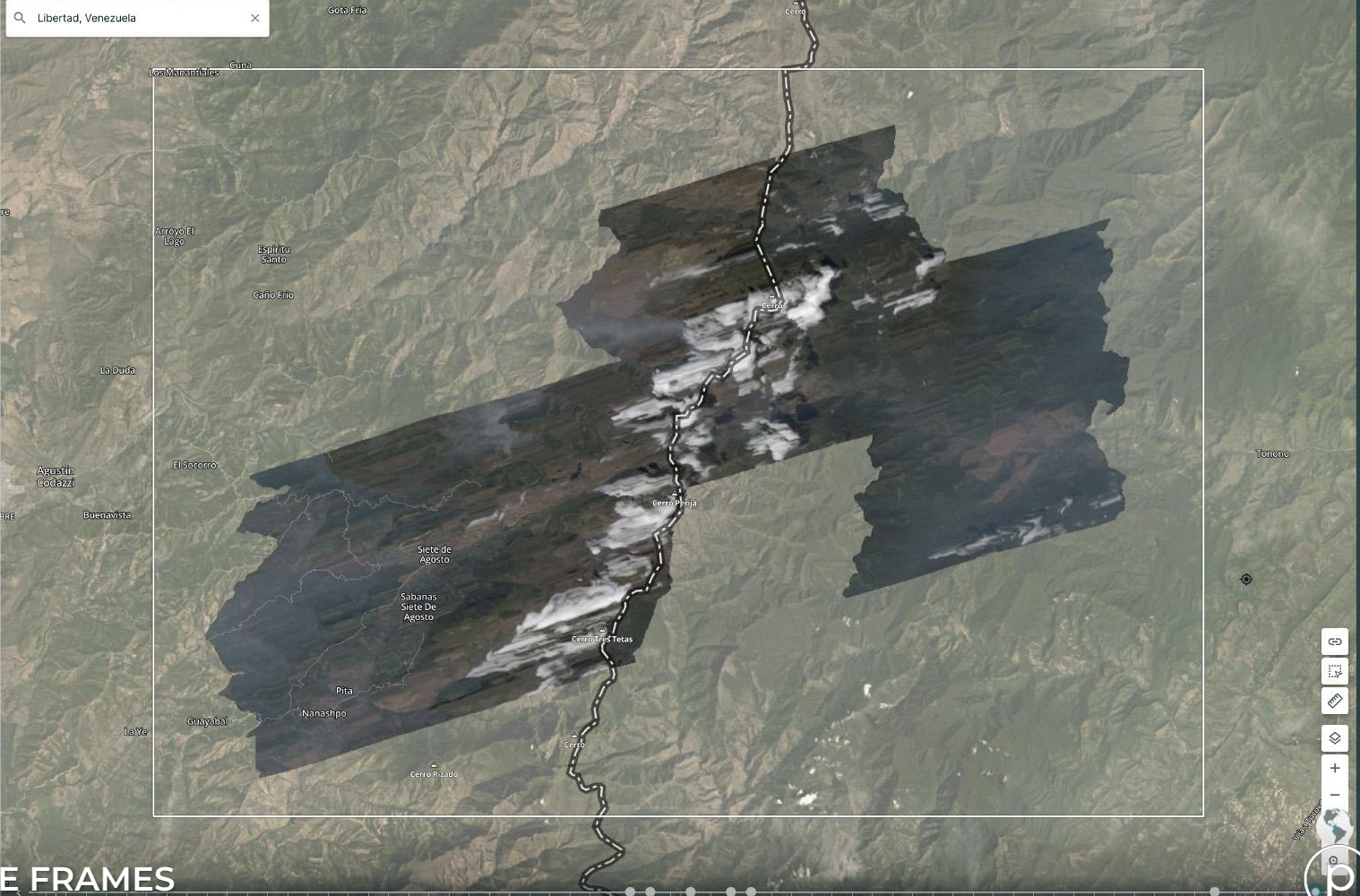
SkySat Scene

0.5m/px 16% Unrectified assets

5 items

January 28, 2023

SkySat Scene



OBLIQUE FRAMES



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OBLIQUE FRAMES





SINGLE CAMERA MERGED OBLIQUE (1/3)





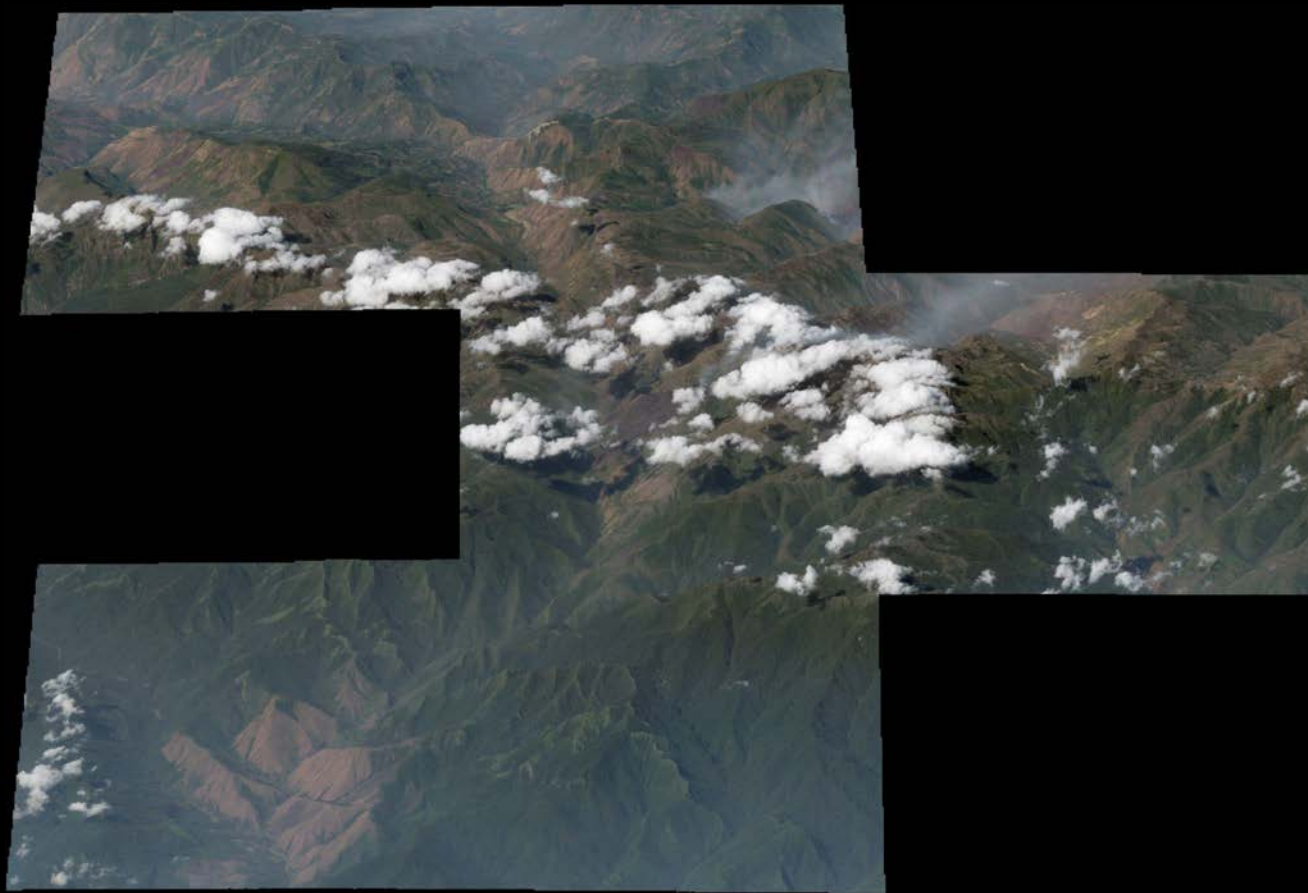
SINGLE CAMERA MERGED OBLIQUE (2/3)





SINGLE CAMERA MERGED OBLIQUE (3/3)





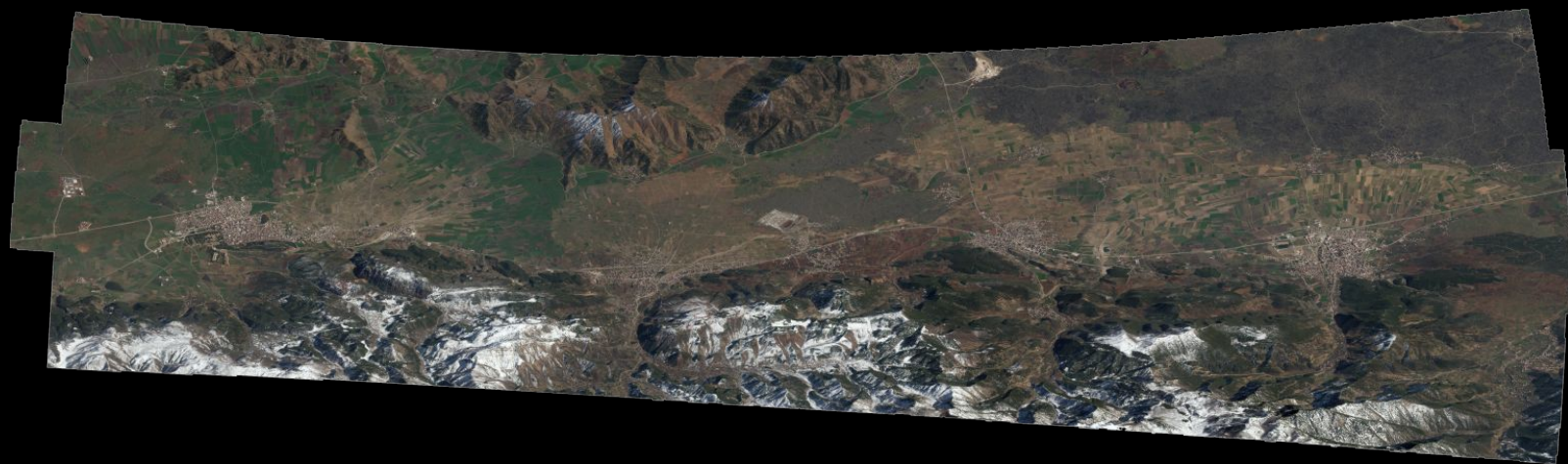
FULL MERGED COLLECT






COLOMBIA/VENEZUELA · March 3, 2023





EARTHQUAKE AFTERMATH · Islahiye, Turkey · February 18, 2023



An aerial photograph showing a large, irregularly shaped lake with a reddish-brown, silty appearance. The lake is situated in a valley, surrounded by steep, rugged mountains. Some of the mountain peaks are covered in snow. The surrounding landscape is a mix of green vegetation and brown, rocky terrain. The lake's formation is a result of a landslide that has blocked a river or stream, creating a natural dam.

Lake forming behind
an earthquake
triggered landslide in
the Nur Dağları (Nur
Mountains) west of
the East Anatolian
Fault.

LANDSLIDE FORMED LAKE · Islahiye, Turkey · February 18, 2023





LANDSLIDE FORMED LAKE · Rishi Ganga, India · February 10, 2021





LANDSLIDE FORMED LAKE · Rishi Ganga, India · February 10, 2021





LANDSLIDE FORMED LAKE · Rishi Ganga, India · February 10, 2021





BAFFIN ISLAND, CANADA · June 21, 2020





BREIDABLIK PEAK, BAFFIN ISLAND, CANADA · June 21, 2020





CUMBRE VIEJA · La Palma, Canary Islands, Spain · October 4, 2021





STATUE OF UNITY · Gujarat, India · November 15, 2018 (RGB) March 21, 2023 (SAR)





ANCIENT GATEWAY

Once a pivotal link in the Silk Road network, Nepal's Mustang district also served as a crossroads for Buddhist scholars, dating back to the 11th century. Following one of the few routes through the Himalaya, merchants traversing Mustang traded Tibetan salt and wool for spices and grains from the Indian subcontinent until the 1950s, when China's annexation of Tibet closed the corridor.



Enriched by trade in the 15th and 16th centuries, the independent Kingdom of Lo grew wealthy by controlling the upper part of Mustang. Taxes on the trade route funded religious artwork and the construction of Buddhist temples.



PLATEAU OF TIBET

CHINA
NEPAL

Tibetan Connection
The Lo-pa people of Mustang are culturally Tibetan but cut off from Chinese-controlled Tibet. They mainly practice Buddhism, unlike the rest of Nepal, which is predominantly Hindu.

- Highway
- Other road
- Hiking trail
- Religious site

ENDING AN ERA OF ISOLATION

The 300-mile journey to Lo Manthang from Nepal's capital, Kathmandu, used to require a two-week trek on foot. A dirt road built over the past decade now makes the trip drivable in about three days, though flooded crossings and landslides often cause delays.

KINGDOM OF LO

MUSTANG

HIMALAYA

Dhaulagiri Himal

Annapurna Himal

Himalayan Passage
The Kali Gandaki River cuts a gorge between two of the world's tallest peaks, Dhaulagiri I and Annapurna I. Farther north, the valley forms a natural bridge to the Plateau of Tibet.

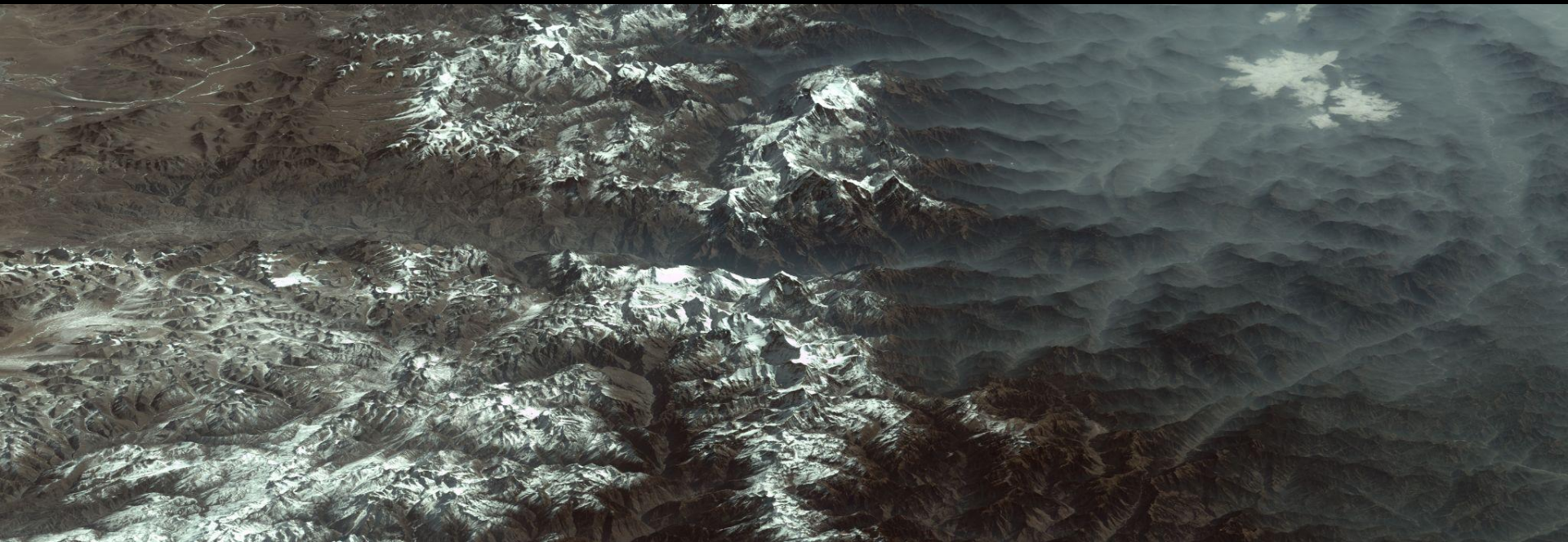
Historic Treks
Many of Mustang's religious sites are accessible only by high-altitude hiking trails. To protect cultural heritage, tourist permits are required.

SCALE VARIES IN THIS PERSPECTIVE
THE STRAIGHT-LINE DISTANCE FROM JHOMPOU TO LO MANTHANG IS 311 MILES.

BILEY D. CHAMPINE, PATRICIA HEAVY, EVE CONANT, NGM STAFF, TERRAIN RENDERING: STEPHEN TYSON
SOURCES: GALEN MUIROR, JAMES MADISON UNIVERSITY; TIM WILLIAMS, UNIVERSITY COLLEGE OF LONDON INSTITUTE OF ARCHAEOLOGY;
GOVERNMENT OF NEPAL; PLAMET LABS PBC; WEBST GEM; OPENSTREETMAP/OSM

SOME LABELS ON THIS MAP USE TIBETAN TRANSLITERATIONS, WHICH DIFFER FROM OFFICIAL NEPALI NAMES.





MUSTANG VALLEY · Nepal







HIMALAYA · Nepal, India, and China





HOOVER DAM · Arizona/Nevada Border · December 12, 2018





COL DU TOURMALET · Pyrenees Mountains, France · July 19, 2019





HALF DOME · Yosemite National Park, California · June 18, 2019





TABLE MOUNTAIN · Cape Town, South Africa · March 19, 2018





MOUNT LICO · Mozambique · March 15, 2020





GLEN CANYON DAM · Page, Arizona · August 14, 2021





TRANGO TOWER · Pakistan · January 23, 2020





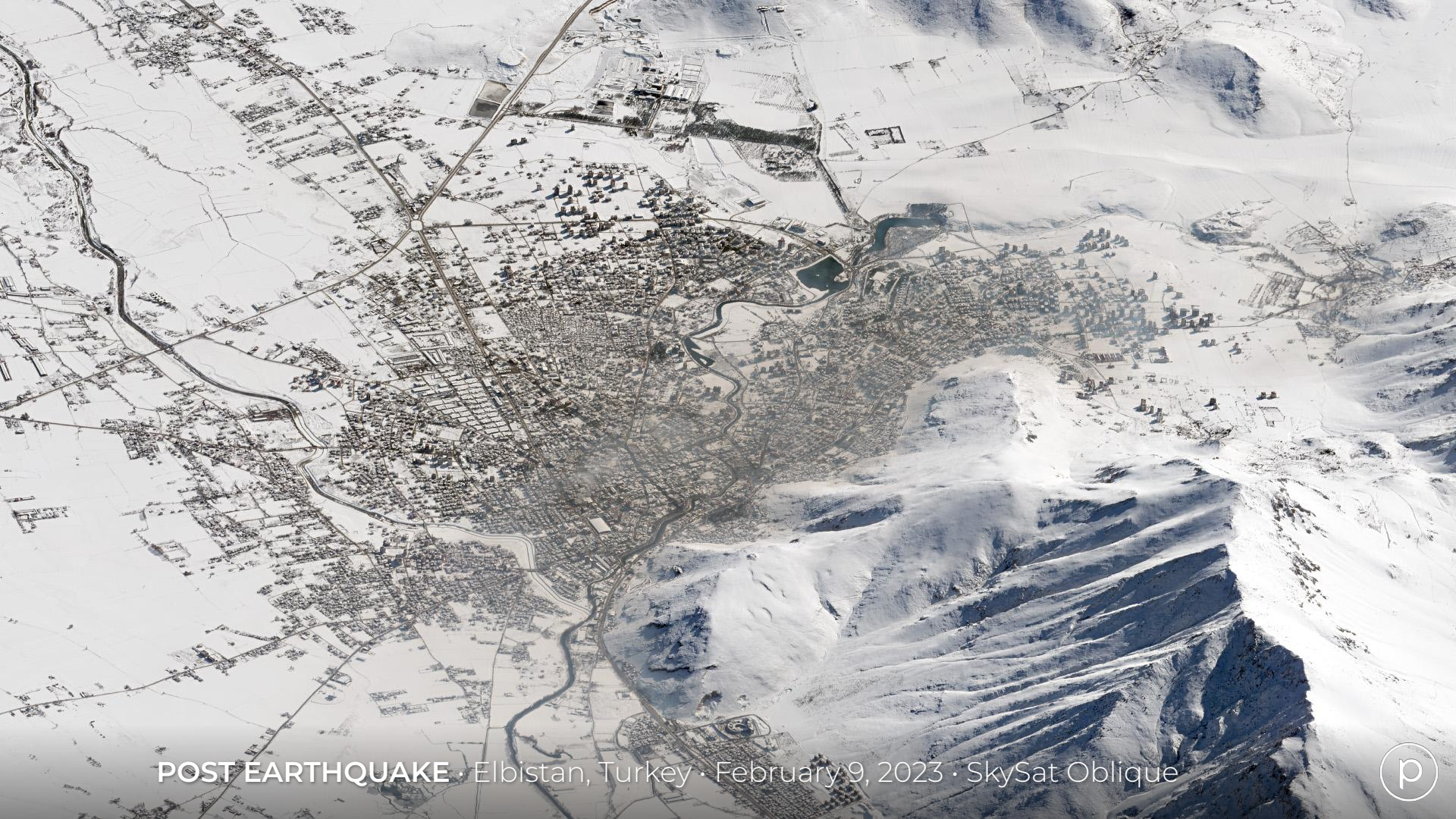
CONCORDIA · Pakistan · March 11, 2018





MANASLU · Nepal · October 6, 2019





POST EARTHQUAKE · Elbistan, Turkey · February 9, 2023 · SkySat Oblique





WEST FACE MOUNT WHITNEY · California · April 4, 2021





PALISADES · Sierra Nevada, California · June 5, 2021





MOUNT KENYA · Kenya · March 16, 2020





SHIVELUCH VOLCANO · Russia · November 8, 2022





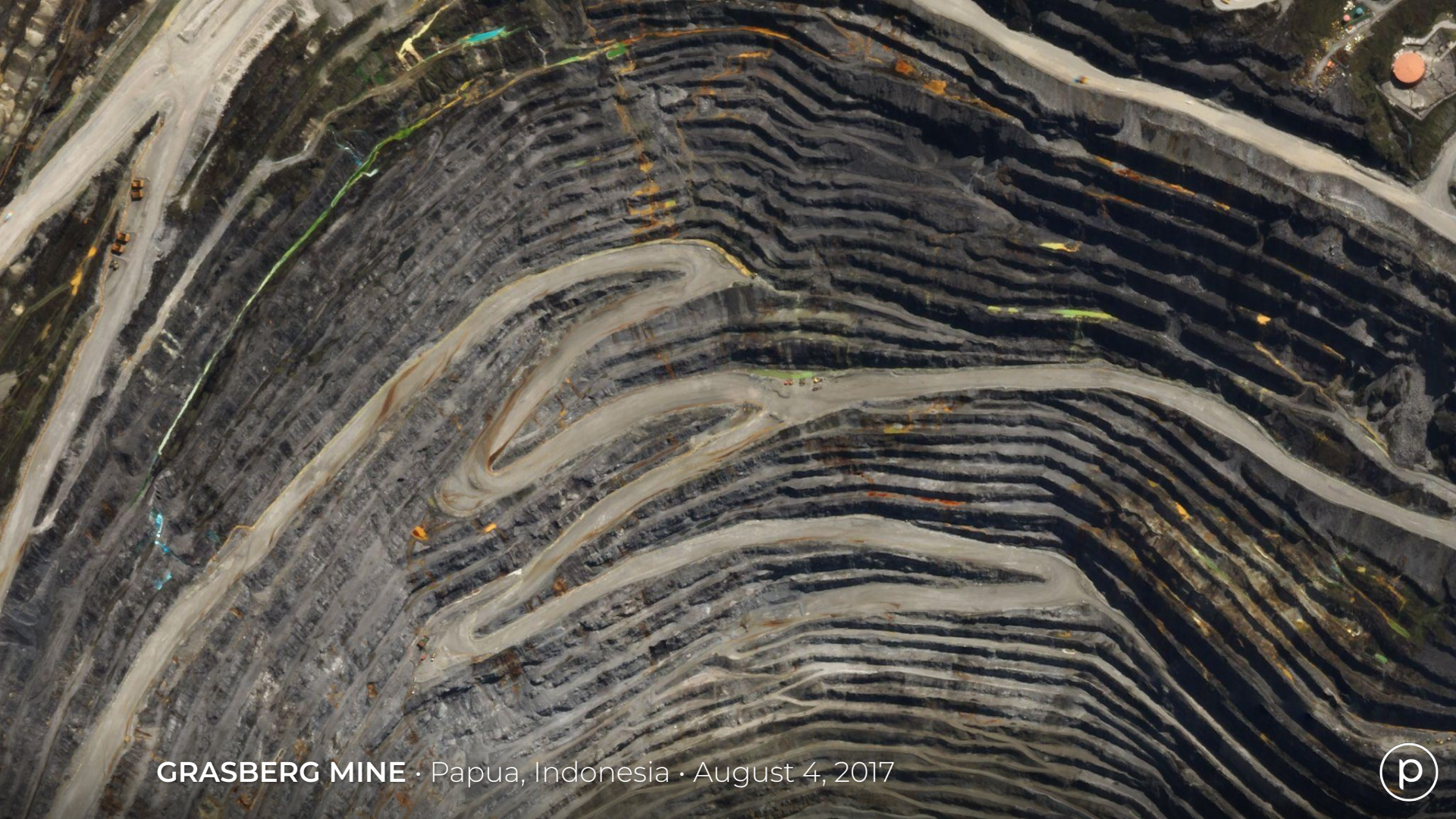
BIG SUR · California · February 4, 2021





BIG SUR · California · February 4, 2021





GRASBERG MINE · Papua, Indonesia · August 4, 2017





BORA BORA · Society Islands · March 9, 2018

