The Payne Institute for Public Policy
AT COLORADO SCHOOL OF MINES

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Tracking a Chemical Explosion in Iran

Commentary by Mikhail Zhizhin, Morgan Bazilian and Christopher Elvidge

A massive explosion occurred on Saturday, April 26, 2025, at the Shahid Rajaee port, located near the southern city of Bandar Abbas, Iran. This port is Iran's largest commercial harbor and a crucial trade hub on the Strait of Hormuz [1]. The Strait of Hormuz is well known as a key transit for global oil trade.

The explosion, purportedly linked to a shipment of sodium perchlorate, a chemical ingredient used in missile propellant, resulted in a significant number of casualties. Initial reports varied, but the latest figures indicate that the death toll has risen to at least 40 people, and around 1,000 others have been reported injured [2].

The scale of the explosion was immense, with black and reddish smoke billowing from the site. The shockwave was reportedly felt up to 50 kilometers away, and windows were shattered in buildings miles from the port. The blast caused widespread damage, with containers smashed and scattered, and vehicles incinerated. Fires raged at the port for many hours, and it took until Sunday for authorities to bring them under control [3].

On the night of April 26th, all three VIIRS satellites—Suomi NPP, NOAA-20, and NOAA-21—detected substantial fires at the Iranian port. Using our VIIRS Nightfire algorithm [4], we measured these fires at a temperature of roughly 900K, with a maximum fire source area of 2800 m^2 and a fire radiative power of 76 MW during that night.

The accompanying animation illustrates these detections captured across multiple satellite passes. In the animation, which includes UTC timestamps, red rectangular footprints

represent individual VIIRS infrared M-band pixel detections. Brighter rectangles indicate greater fire radiative power (heat intensity). The numerous overlapping detections are co-located with the place of explosion in the port, demonstrate widespread and intense fire activity throughout the night following the disaster.

References

[1] https://www.aljazeera.com/news/2025/4/27/irans-president-pezeshkian-visits-injured-site-of-deadly-port-explosion

[2] https://apnews.com/article/iran-port-shahid-rajaei-explosion-fire-bandar-abbas-fd31972422ae1612006b1c8005f58440

[3] https://www.newsweek.com/iran-probe-after-deadly-explosion-strategic-port-bandar-abbas-2064895

[4] https://www.mdpi.com/2072-4292/5/9/4423

About the Authors

Mikhail Zhizhin, Research Associate, Earth Observation Group, Payne Institute for Public Policy, Colorado School of Mines

Mikhail Zhizhin, M.Science in mathematics from the Moscow State University in 1984, Ph.D. in computational seismology and pattern recognition from the Russian Acad. Sci. in 1992. Research positions from 1987 to 2012 in geophysics, space research and nuclear physics at Russian Acad. Sci., later at NOAA and CU Boulder. Currently he is a researcher at the Earth Observation Group at Colorado School of Mines. His applied research fields evolved from high performance computing in seismology, geodynamics, terrestrial and space weather to deep learning in remote sensing. He is developing new machine learning algorithms to better understand the Nature with Big Data.

Morgan Bazilian
Director, Payne Institute and Professor of Public Policy

Morgan Bazilian is the Director of the Payne Institute and a Professor of public policy at the Colorado School of Mines. Previously, he wD.as lead energy specialist at the World Bank. He has over two decades of experience in the energy sector and is regarded as a leading expert in international affairs, policy and investment. He is a Member of the Council on Foreign Relations.

Christopher Elvidge
Senior Research Associate, Director of Earth Observation Group

Christopher D. Elvidge has decades of experience with satellite low-light imaging data, starting in 1994. He pioneered nighttime satellite observation on visible lights, heat sources including gas flares and wildfires, as well as bright lit fishing vessels. He led the development of these nighttime remote sensed products with images from DMSP, JPSS, and Landsat satellites. These data are very popular and used globally in both public and private sectors. As of February 2018, he has more than 11,000 scholarly publication citations.

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