The Payne Institute for Public Policy
COLORADO SCHOOL OF MINES
EARTH • ENERGY • ENVIRONMENT

PAYNE INSTITUTE COMMENTARY SERIES: **BRIEF**

Monitoring of Portovaya Gas Flares

By Christopher Elvidge, Mikhail Zhizhin, Kelly Taber, and Morgan Bazilian

Using a proprietary Visible Infrared Imaging Radiometer Suite (VIIRS) Nightfire clustering algorithm, Payne Institute scientists are monitoring two flares from Liquified Natural Gas (LNG) production facilities owned by Gazprom near Portovaya, Russia.

A small flare at the site has been active since 2017. A second, large flare began in July 2022 with gas flowrates of 2 million cubic meters/day, which subsided in August 2022. The site maximum flowrate is 5.7 million cubic meters/day. While substantial volumes were identified, equal and greater gas flaring amounts have been previously detected at other LNG sites around the world, according to Payne Institute Earth Observation Group Research Associate Mikhail Zhizhin.

The Portovaya flares are estimated to have emitted 9,000 tons of CO2 daily causing environmental disaster concerns. Flaring coincided with Russia's reduction of natural gas supplies after international sanctions resulting from the war in Ukraine. Rather than shutting down production, flaring burned gas supplies that exceeded site storage capacity. Russian media reported that the primary customers of the facilities' LNG were Finland, across the border from Portovaya, and countries neighboring the Baltic Sea.

Gas flaring volumes in Russia are estimated to average at 23 billion cubic meters (BCM) annually (15% of global flaring), with 19 BCM (82% on national scale) corresponding to the oil upstream flaring. Flaring volumes in Russia have risen since 2018, making it one of the world's major associated petroleum gas flaring (APG) nations.

The VIIRS Nightfire (VNF) algorithm captures nightly data using satellite-based infrared channels to determine heat anomalies, gas flaring activity, and associated environmental impacts of gas flaring. High-temperature biomass burning and low-temperature gas flaring are identified with flare location, temperature, and flared gas volume. Gas flaring volumes are derived from radiant heat and calculated

from temperature and source size using Stefan-Boltzmann Law. Payne Institute scientists' in-depth analysis provides data on gas flaring impacts by country on an annual basis.

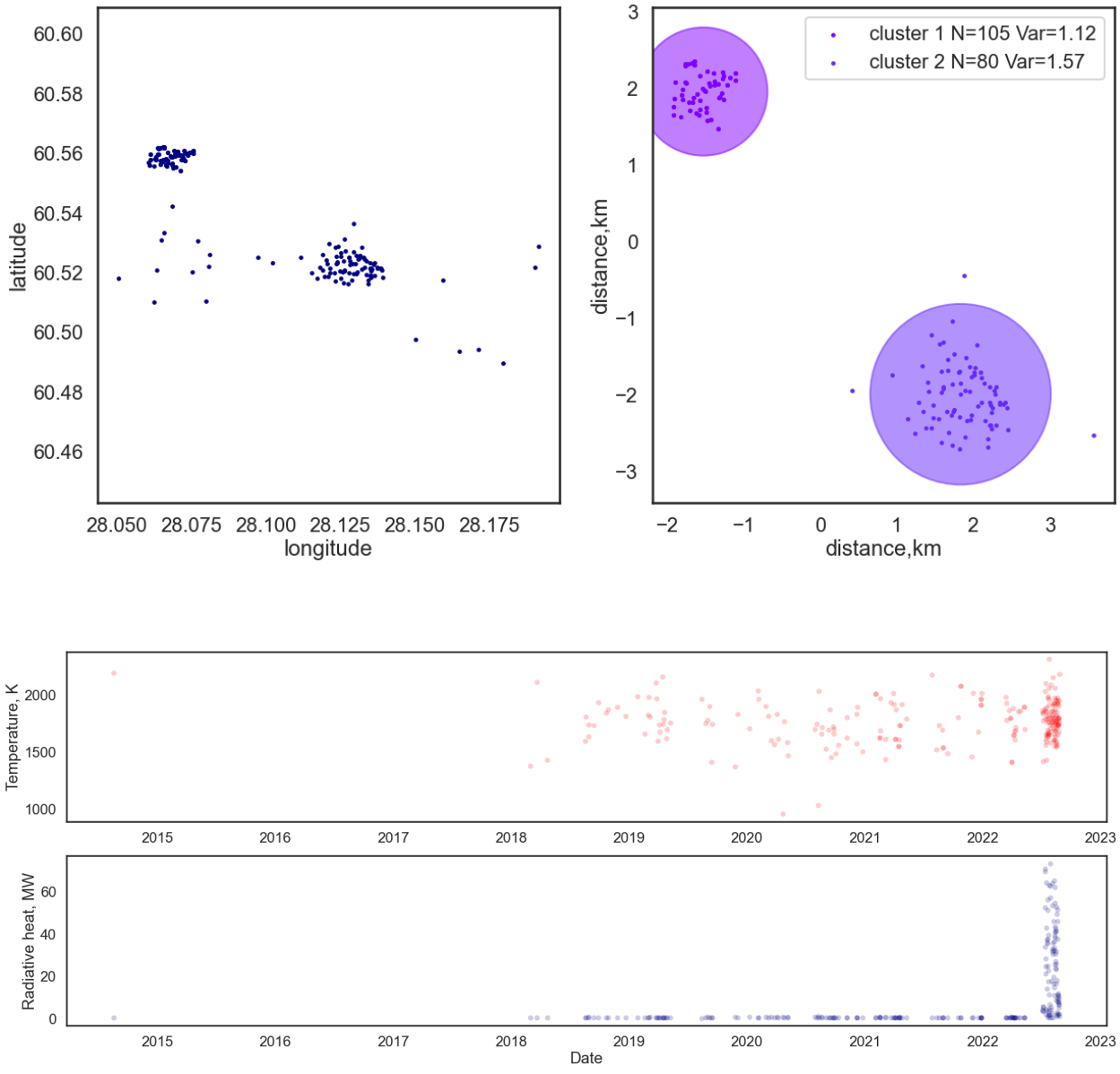

IMAGE CAPTION:

VIIRS observations of two flares from Gazprom-owned LNG facilities in Portovaya, Russia.

IMAGE CAPTION:

Portovaya LNG facilities border Finland and the Baltic Sea.

The Payne Institute for Public Policy

COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

ABOUT THE AUTHORS

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 wild fires, 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.

Mikhail Zhizhin
Research Associate, Earth Observation Group

Zhizhin Mikhail Nikolaevich, M.Sci 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.

Kelly Taber
Payne Institute Communications Associate

Kelly Taber is a freelance writer specializing in research topics. She previously worked as an analyst and technical writer at the U.S. Department of Energy's National Energy Technology Laboratory in Morgantown, WV and received her master's degree in Communication Studies from West Virginia University and bachelor's degrees in Political Science and Journalism from University of Mary Washington. She began her career as an award-winning business reporter at newspapers in West Virginia and Virginia.

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.

The Payne Institute for Public Policy

COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

ABOUT THE PAYNE INSTITUTE

The mission of the Payne Institute at Colorado School of Mines is to provide world-class scientific insights, helping to inform and shape public policy on earth resources, energy, and environment. The Institute was established with an endowment from Jim and Arlene Payne, and seeks to link the strong scientific and engineering research and expertise at Mines with issues related to public policy and national security.

The Payne Institute Commentary Series offers independent insights and research on a wide range of topics related to energy, natural resources, and environmental policy. The series accommodates three categories namely: Viewpoints, Essays, and Working Papers.

For more information about the Payne Institute please visit:

https://payneinstitute.mines.edu/

DISCLAIMER: The opinions, beliefs, and viewpoints expressed in this article are solely those of the author and do not reflect the opinions, beliefs, viewpoints, or official policies of the Payne Institute or the Colorado School of Mines, the Issam Fares Institute or the American University of Lebanon.