

# School of Earth and Environmental Sciences Fall 2024 Colloquium Series

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Science Building C-207

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### Forecasting and predicting volcanic eruptions

Explosive eruptions of VEI < 3 commonly occur with few or no warning signs. Such eruptions can be magmatic, phreatomagmatic, or phreatic in nature, and they are driven by catastrophic release of pressurized gas. Our challenge is how to better forecast these eruptions, and better understand them, with existing and new tools. Here I examine a number of such eruptions, some lethal to humans, which have occurred during the last decade. I describe the key precursory signals that preceded these events, examine whether they developed in a bottom-up or top-down fashion, and compare the different timescales of precursory activity. Four types of precursory signals may be generally applicable and exportable for these volcanic systems: gas ratios including  $\text{CO}_2/\text{SO}_2$  and  $\text{H}_2\text{S}/\text{SO}_2$ , volcanotectonic seismic swarms, localized or displaced ground deformation, and banded tremor. I conclude by outlining four grand challenges for the next decade: a full view of subsurface volcano plumbing, systematized monitoring networks with higher temporal and spatial resolution, full and complete forecasts of explosive eruptions, and the development of novel approaches and capabilities.

