

# Joshua D Carmichael, Scientist II

Seismo-Acoustics

EES-17, Los Alamos National Laboratory, Los Alamos NM, 87545

Work: (505)-667-1446 | Cell: (360)-440-9139

[joshuac@lanl.gov](mailto:joshuac@lanl.gov) Web: <http://www.lanl.gov/expertise/profiles/view/joshua-carmichael>

---

**Objective** To advance and utilize multi-phenomenological geophysical detection, modeling and discrimination tools that identify natural and man-made waveform signatures of national and global security threats

- 
- Active Research**
- Integrate multiple geophysical signatures of explosions (seismic, acoustic & radio frequency) to detect and screen natural waveform emissions from sources of weaponization activity
  - Develop source physics models for seismo-acoustic energy partitioning of shallowly buried and airborne explosions, and explosive sources in variable emplacement conditions
  - Advance hypothesis testing to dynamically changing receiver networks to adaptively detect and estimate multiple geophysical source parameters in evolving monitoring conditions
  - Modeling and interpretation of geophysical observations from polar regions and glacial ice

---

**Peer Refereed Publication**

**First Author Peer Reviewed Publications**

- Carmichael, J. D., (2016). A Waveform Detector that Targets Template-Decorrelated Signals and Achieves its Predicted Performance: Demonstration with IMS Data (Part I). *Bulletin of the Seismological Society of America*, 106(5). 16 pages (*in press*)
- Carmichael, J. D., & Hartse, H. (2016). Threshold Magnitudes for a Multichannel Correlation Detector in Background Seismicity. *Bulletin of the Seismological Society of America*, 106(2), 478-498. doi: 10.1785/0120150191
- Carmichael, J. D., Nemzek, R., Arrowsmith, S. and Sentz, K. (2016) EXPRESS LETTER: Fusing Geophysical Signatures Of Locally Recorded Surface Explosions To Improve Blast Detection. *Geophys. J. Int.* 204 (3): 1838-1842. doi:10.1093/gji/ggw006
- Carmichael, J. D., Joughin, I., Behn, M. D., Das, S., King, M. A., Stevens, L., & Lizarralde, D. (2015). Seismicity On The Western Greenland Ice Sheet: Surface Fracture In The Vicinity Of Active Moulins. *Journal of Geophysical Research: Earth Surface*, 120(6), 1082-1106. doi: 10.1002/2014JF003398.
- Carmichael, J. D., Pettit, E. C., Hoffman, M., Fountain, A., & Hallet, B. (2012). Seismic Multiplet Response Triggered By Melt At Blood Falls, Taylor Glacier, Antarctica. *Journal of Geophysical Research: Earth Surface*, 117(F3). doi:10.1029/2011JF002221
- **Thesis:** Melt-Triggered Seismic Response in Hydraulically-Active Polar Ice: Observations and Methods, University of Washington, 2013

**First Author Submissions Currently Under Peer Review**

- Carmichael, Joshua D., Hartse, Hans E., Begnaud, Michael L., Ford, Sean R., Dodge, Doug A., Phillips, W. Scott, Anderson, Dale N. (2016) Submitted to: *Defense Research Review*, July 28 2016. Estimated 42 pages, 23 Figures.

---

**Education**

**PhD, Geophysics (2013)**

**University of Washington, Seattle, WA**

- Seismology, Glaciology, Statistical Signal Processing
- **Thesis:** Melt-Triggered Seismic Response in Hydraulically-Active Polar Ice: Observations and Methods; *Adviser: Ian R Joughin, Applied Physics Laboratory*

**Masters of Science, Applied Mathematics (2008)**

**University of Washington, Seattle, WA**

- Vector Space Projections: Inner Product Choice with Signal Processing Applications

**Bachelor of Science, Physics (2004)**

**Washington State University, Pullman, WA**

- Magna Cum Laude
  - Writing with Distinction
-

---

<b>Internships</b>	<b>AltaRock Energy, Seattle WA</b> <ul style="list-style-type: none"><li>• Jan-April 2012: Seismic data acquisition, data processing, and deployment of microseismic array</li></ul> <b>ExxonMobil Upstream Research Co., Houston TX</b> <ul style="list-style-type: none"><li>• Jun-Sep 2009: Geophysics Division, Quantitative Interpretation, Low Freq and Passive Sources</li></ul>
<b>Technical Skills</b>	<ul style="list-style-type: none"><li>• <b>Data:</b> probability, wavelets, correlation/coherency, clustering, array processing, inverse theory, numerical linear algebra, detection &amp; estimation theory, statistical hypothesis testing</li><li>• <b>Seismic:</b> magnitude estimates, source mechanics, hypocentral inversion, multiplet analyses, ray-shooting, wavefield polarization, near surface explosions, Rayleigh wave analyses</li><li>• <b>Wavefield:</b> spherical wave propagation near planar interfaces, conservation laws, scaling</li><li>• <b>Electromagnetic:</b> Radio frequency emissions, pulse detection, explosive generation</li><li>• <b>Physical Modeling:</b> glacial hydrology, elastodynamics, thermodynamics, viscous fluids</li><li>• <b>Numerical:</b> MATLAB, finite difference methods, finite volume methods, PDF estimation</li></ul>

---