



Antony Fraser-Smith

Professor (Research) of Electrical Engineering and of Geophysics, Emeritus

Bio

BIO

Fraser-Smith's research focuses on the use of low frequency electromagnetic fields, both as a means of probing (1) the interior of the earth, and (2) the space environment near the earth, as well as for communicating with, and detecting, objects submerged in the sea or buried in the earth, and for detecting changes taking place in the Earth and the near-Earth space environment.

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Electrical Engineering

ADMINISTRATIVE APPOINTMENTS

- Associate Chair, Department of Electrical Engineering, (1996-2000)

HONORS AND AWARDS

- Antarctica Service Medal of the United States, United States (1984)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Chair, Russian Earthquake Prediction Evaluation Study, Gore-Chernomyrdin Commission (1995 - 1997)
- Fellow, Institute of Physics, London (1969 - present)
- Fellow, Geological Society of America (1998 - present)
- Life Member, American Physical Society (1968 - present)
- Member, American Geophysical Union (1974 - present)

LINKS

- <http://www-star.stanford.edu/~acfs/>: <http://www-star.stanford.edu/~acfs/>

Publications

PUBLICATIONS

- **Single-Station Lightning Location Using Azimuth and Time of Arrival of Sferics** *RADIO SCIENCE*
Koochak, Z., Fraser-Smith, A.
2020; 55 (2)
- **An Update on the Centered and Eccentric Geomagnetic Dipoles and Their Poles for the Years 1980-2015** *EARTH AND SPACE SCIENCE*
Koochak, Z., Fraser-Smith, A. C.
2017; 4 (10): 626–36

- **The ULF magnetic fields generated by thunderstorms: A source of ULF geomagnetic pulsations?** *RADIO SCIENCE*
Fraser-Smith, A. C., Kjono, S. N.
2014; 49 (12): 1162-1170
- **The Earth's electromagnetic environment** *GEOPHYSICAL RESEARCH LETTERS*
Fuellekrug, M., Fraser-Smith, A. C.
2011; 38
- **Comment on "Natural magnetic disturbance fields, not precursors, preceding the Loma Prieta earthquake" by Wallace H. Campbell** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Fraser-Smith, A. C., MCGILL, P. R., Bernardi, A.
2011; 116
- **World coverage for single station lightning detection** *RADIO SCIENCE*
Mackay, C., Fraser-Smith, A. C.
2011; 46
- **Lightning location using the slow tails of sferics** *RADIO SCIENCE*
Mackay, C., Fraser-Smith, A. C.
2010; 45
- **The effective antenna noise figure F-a for a vertical loop antenna and its application to extremely low frequency/very low frequency atmospheric noise** *RADIO SCIENCE*
Fraser-Smith, A. C.
2007; 42 (4)
- **The planetary rate of sprite events** *GEOPHYSICAL RESEARCH LETTERS*
Ignaccolo, M., Farges, T., Mika, A., Allin, T. H., Chanrion, O., Blanc, E., Neubert, T., Fraser-Smith, A. C., Fuellekrug, M.
2006; 33 (11)
- **A Clustering Poisson model for characterizing the interarrival times of sferics** *RADIO SCIENCE*
Chrissan, D. A., Fraser-Smith, A. C.
2003; 38 (4)
- **Ultra-low frequency electromagnetic measurements associated with the 1998 M-w 5.1 San Juan Bautista, California earthquake and implications for mechanisms of electromagnetic earthquake precursors** *TECTONOPHYSICS*
Karakelian, D., Klemperer, S. L., Fraser-Smith, A. C., Thompson, G. A.
2002; 359 (1-2): 65-79
- **Global ionospheric D-layer height monitoring** *EUROPHYSICS LETTERS*
Fullekrug, M., Fraser-Smith, A. C., Schlegel, K.
2002; 59 (4): 626-632
- **Analysis of ultralow-frequency electromagnetic field measurements associated with the 1999 M 7.1 Hector Mine, California, earthquake sequence** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
Karakelian, D., Beroza, G. C., Klemperer, S. L., Fraser-Smith, A. C.
2002; 92 (4): 1513-1524
- **Modal phenomena in the natural electromagnetic spectrum below 5 kHz** *RADIO SCIENCE*
Porrat, D., Bannister, P. R., Fraser-Smith, A. C.
2001; 36 (3): 499-506
- **Detection of transients in 1/f noise with the undecimated discrete wavelet transform** *IEEE TRANSACTIONS ON SIGNAL PROCESSING*
Liu, T. T., Fraser-Smith, A. C.
2000; 48 (5): 1458-1462
- **The manifestation of the Madden-Julian oscillation in global deep convection and in the Schumann resonance intensity** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
Anyamba, E., Williams, E., Susskind, J., Fraser-Smith, A., Fullekrug, M.
2000; 57 (8): 1029-1044

- **A comparison of low-frequency radio noise amplitude probability distribution models** *RADIO SCIENCE*
Chrissan, D. A., Fraser-Smith, A. C.
2000; 35 (1): 195-208
- **On the hourly contribution of global cloud-to-ground lightning activity to the atmospheric electric field in the Antarctic during December 1992** *JOURNAL OF ATMOSPHERIC AND SOLAR-TERRESTRIAL PHYSICS*
Fullekrug, M., Fraser-Smith, A. C., Bering, E. A., Few, A. A.
1999; 61 (10): 745-750
- **An undecimated wavelet transform based detector for transients in 1/f noise** *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 99)*
Liu, T. T., Fraser-Smith, A. C.
IEEE.1999: 1185–1188
- **Ultra-slow tails of sprite-associated lightning flashes** *GEOPHYSICAL RESEARCH LETTERS*
Fullekrug, M., Fraser-Smith, A. C., Reising, S. C.
1998; 25 (18): 3497-3500
- **Reception of ELF signals at antipodal distances** *RADIO SCIENCE*
Fraser-Smith, A. C., Bannister, P. R.
1998; 33 (1): 83-88
- **Identification and removal of man-made transients from geomagnetic array time series: A wavelet transform based approach** *32nd Asilomar Conference on Signals, Systems and Computers*
Liu, T. T., Fraser-Smith, A. C.
IEEE.1998: 1363–1367
- **Global lightning and climate variability inferred from ELF magnetic field variations** *GEOPHYSICAL RESEARCH LETTERS*
Fullekrug, M., FRASERSMITH, A. C.
1997; 24 (19): 2411-2414
- **The manifestation of the Madden-Julian oscillation in global deep convection and in the Schumann resonance intensity** *22nd Conference on Hurricanes and Tropical Meteorology*
Anyamba, E., Williams, E., Susskind, J., FraserSmith, A., Fullekrug, M.
AMER METEOROLOGICAL SOCIETY.1997: 227–231
- **Further evidence for a global correlation of the Earth-ionosphere cavity resonances** *GEOPHYSICAL RESEARCH LETTERS*
Fullekrug, M., FRASERSMITH, A. C.
1996; 23 (20): 2773-2776
- **Seasonal variations of globally measured ELF/VLF radio noise** *RADIO SCIENCE*
Chrissan, D. A., FRASERSMITH, A. C.
1996; 31 (5): 1141-1152
- **VLF WAVE EXPERIMENTS IN-SPACE USING A MODULATED ELECTRON-BEAM** *JOURNAL OF SPACECRAFT AND ROCKETS*
Raitt, W. J., Ernstmeier, J., Myers, N. B., White, A. B., Sasaki, S., Oyama, K. I., Kawashima, N., FRASERSMITH, A. C., Gilchrist, B. E., Hallinan, T. J.
1995; 32 (4): 670-679
- **ULTRA-LOW FREQUENCY MAGNETIC-FIELD MEASUREMENTS IN SOUTHERN CALIFORNIA DURING THE NORTHRIDGE EARTHQUAKE OF 17 JANUARY 1994** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C., MCGILL, P. R., Helliwell, R. A., VILLARD, O. G.
1994; 21 (20): 2195-2198
- **GROUND-BASED VLF MEASUREMENTS DURING PULSED ELECTRON-BEAM EMISSIONS IN THE IONOSPHERE** *ADVANCES IN SPACE RESEARCH*
Myers, N. B., Ernstmeier, J., McGill, P., FRASERSMITH, A. C., Raitt, W. J., Thompson, D. C.
1993; 13 (10): 99-102
- **A SEARCH FOR ELF VLF EMISSIONS INDUCED BY EARTHQUAKES AS OBSERVED IN THE IONOSPHERE BY THE DE-2 SATELLITE** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Henderson, T. R., Sonwalkar, V. S., Helliwell, R. A., Inan, U. S., FRASERSMITH, A. C.

1993; 98 (A6): 9503-9514

- **COMPARISON OF ULTRA-LOW FREQUENCY ELECTROMAGNETIC SIGNALS WITH AFTERSHOCK ACTIVITY DURING THE 1989 LOMA-PRIETA EARTHQUAKE SEQUENCE** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
FENOGLIO, M. A., FRASERSMITH, A. C., Beroza, G. C., Johnston, M. J.
1993; 83 (2): 347-357
- **ULF MAGNETIC-FIELDS GENERATED BY ELECTRICAL STORMS AND THEIR SIGNIFICANCE TO GEOMAGNETIC PULSATION GENERATION** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C.
1993; 20 (6): 467-470
- **RESULTS OF ULF MAGNETIC-FIELD MEASUREMENTS NEAR THE EPICENTERS OF THE SPITAK (M=6.9) AND THE LOMA-PRIETA (M=7.1) EARTHQUAKES - COMPARATIVE-ANALYSIS** *1st Annual Workshop of the Geophysical Technology Transfer Initiative on Russian Airborne Geophysics and Remote Sensing*
Kopytenko, Y. A., Voronov, P. M., Kopytenko, E. A., MATIASHVILI, T. G., FRASERSMITH, A. C., Bernardi, A.
SPIE - INT SOC OPTICAL ENGINEERING.1993: 317-329
- **GROUND-BASED VLF MEASUREMENTS DURING PULSED ELECTRON-BEAM EMISSIONS IN THE IONOSPHERE** *TOPICAL MEETING OF COSPAR-INTERDISCIPLINARY-SCIENTIFIC-COMMISSION : SPACE PLASMA PHYSICS, AT THE COSPAR 29TH PLENARY MEETING*
Myers, N. B., Ernstmeier, J., McGill, P., FRASERSMITH, A. C., Raitt, W. J., Thompson, D. C.
PERGAMON PRESS LTD.1993: 99-102
- **THE NATURAL BACKGROUND LEVELS OF 50/60 HZ RADIO NOISE** *IEEE TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY*
FRASERSMITH, A. C., Bowen, M. M.
1992; 34 (3): 330-337
- **RESULTS OF ULF MAGNETIC-FIELD MEASUREMENTS NEAR THE EPICENTERS OF THE SPITAK (M(S) = 6.9) AND LOMA-PRIETA (M(S) = 7.1) EARTHQUAKES - COMPARATIVE-ANALYSIS** *GEOPHYSICAL RESEARCH LETTERS*
Molchanov, O. A., Kopytenko, Y. A., Voronov, P. M., Kopytenko, E. A., MATIASHVILI, T. G., FRASERSMITH, A. C., Bernardi, A.
1992; 19 (14): 1495-1498
- **GROUND-LEVEL SIGNAL STRENGTH OF ELECTROMAGNETIC-WAVES GENERATED BY PULSED ELECTRON-BEAMS IN SPACE** *PLANETARY AND SPACE SCIENCE*
HARKER, K. J., Neubert, T., BANKS, P. M., FRASERSMITH, A. C., Donohue, D. J.
1991; 39 (11): 1527-1535
- **ULF MAGNETIC-FIELD MEASUREMENTS NEAR THE EPICENTER OF THE MS7.1 LOMA-PRIETA EARTHQUAKE** *PHYSICS OF THE EARTH AND PLANETARY INTERIORS*
Bernardi, A., FRASERSMITH, A. C., MCGILL, P. R., VILLARD, O. G.
1991; 68 (1-2): 45-63
- **OBSERVATIONS OF PLASMA-WAVE TURBULENCE GENERATED AROUND LARGE IONOSPHERIC SPACECRAFT - EFFECTS OF MOTIONALLY INDUCED EMF AND OF ELECTRON-BEAM EMISSION** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Neubert, T., Sasaki, S., Gilchrist, B. E., BANKS, P. M., Williamson, P. R., FRASERSMITH, A. C., Raitt, W. J.
1991; 96 (A6): 9639-9654
- **BACKGROUND MAGNETIC SPECTRA - APPROXIMATELY 10(-5) TO APPROXIMATELY 10(5) HZ** *GEOPHYSICAL RESEARCH LETTERS*
LANZEROTTI, L. J., MacLennan, C. G., FRASERSMITH, A. C.
1990; 17 (10): 1593-1596
- **LOW-FREQUENCY MAGNETIC-FIELD MEASUREMENTS NEAR THE EPICENTER OF THE MS-7.1 LOMA-PRIETA EARTHQUAKE** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C., Bernardi, A., MCGILL, P. R., Ladd, M. E., Helliwell, R. A., VILLARD, O. G.
1990; 17 (9): 1465-1468
- **THE INTERACTION OF AN ARTIFICIAL ELECTRON-BEAM WITH THE EARTH'S UPPER-ATMOSPHERE - EFFECTS ON SPACECRAFT CHARGING AND THE NEAR-PLASMA ENVIRONMENT** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Neubert, T., BANKS, P. M., Gilchrist, B. E., FRASERSMITH, A. C., Williamson, P. R., Raitt, W. J., Myers, N. B., Sasaki, S.
1990; 95 (A8): 12209-12217

- **FURTHER INVESTIGATION OF THE INTERFERENCE MINIMUMS IN THE LOW-FREQUENCY ELECTROMAGNETIC-FIELDS PRODUCED BY A SUBMERGED VERTICAL MAGNETIC DIPOLE** *RADIO SCIENCE*
Inan, A. S., FRASERSMITH, A. C.
1990; 25 (4): 339-347
- **VLF WAVE EMISSIONS BY PULSED AND DC ELECTRON-BEAMS IN SPACE .1. SPACELAB-2 OBSERVATIONS** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Reeves, G. D., BANKS, P. M., Neubert, T., Bush, R. I., Williamson, P. R., FRASERSMITH, A. C., Gurnett, D. A., Raitt, W. J.
1988; 93 (A12): 14699-?
- **SEABED PROPAGATION OF ULF/ELF ELECTROMAGNETIC-FIELDS FROM HARMONIC DIPOLE SOURCES LOCATED ON THE SEAFLOOR** *RADIO SCIENCE*
FRASERSMITH, A. C., Inan, A. S., VILLARD, O. G., JOINER, R. G.
1988; 23 (6): 931-943
- **VLF WAVE STIMULATION BY PULSED ELECTRON-BEAMS INJECTED FROM THE SPACE-SHUTTLE** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Reeves, G. D., BANKS, P. M., FRASERSMITH, A. C., Neubert, T., Bush, R. I., Gurnett, D. A., Raitt, W. J.
1988; 93 (A1): 162-174
- **LARGE-AMPLITUDE CHANGES INDUCED BY A SEABED IN THE SUB-LF ELECTROMAGNETIC-FIELDS PRODUCED IN, ON, AND ABOVE THE SEA BY HARMONIC DIPOLE SOURCES** *RADIO SCIENCE*
FRASERSMITH, A. C., BUBENIK, D. M., VILLARD, O. G.
1987; 22 (4): 567-577
- **CENTERED AND ECCENTRIC GEOMAGNETIC DIPOLES AND THEIR POLES, 1600-1985** *REVIEWS OF GEOPHYSICS*
FRASERSMITH, A. C.
1987; 25 (1): 1-16
- **ULF ELF ELECTROMAGNETIC-FIELDS GENERATED ALONG THE SEA-FLOOR INTERFACE BY A STRAIGHT CURRENT SOURCE OF INFINITE LENGTH** *RADIO SCIENCE*
Inan, A. S., FRASERSMITH, A. C., VILLARD, O. G.
1986; 21 (3): 409-420
- **ULF ELF ELECTROMAGNETIC-FIELDS PRODUCED IN A CONDUCTING MEDIUM OF INFINITE EXTENT BY A LINEAR CURRENT SOURCE OF FINITE LENGTH** *IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION*
Inan, A. S., FRASERSMITH, A. C., VILLARD, O. G.
1985; 33 (12): 1363-1369
- **ULF/ELF ELECTROMAGNETIC-FIELDS PRODUCED IN A CONDUCTING MEDIUM OF INFINITE EXTENT BY LINEAR CURRENT SOURCES OF INFINITE LENGTH** *RADIO SCIENCE*
Inan, A. S., FRASERSMITH, A. C., VILLARD, O. G.
1983; 18 (6): 1383-1392
- **ULF LOWER-ELF ELECTROMAGNETIC-FIELD MEASUREMENTS IN THE POLAR CAPS** *REVIEWS OF GEOPHYSICS*
FRASERSMITH, A. C.
1982; 20 (3): 497-512
- **IS THERE AN INCREASE OF GEOMAGNETIC-ACTIVITY PRECEDING TOTAL LUNAR ECLIPSES** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
FRASERSMITH, A. C.
1982; 87 (NA2): 895-898
- **LONG-TERM PREDICTIONS OF PC-1 GEOMAGNETIC-PULSATIONS - COMPARISON WITH OBSERVATIONS** *PLANETARY AND SPACE SCIENCE*
FRASERSMITH, A. C.
1981; 29 (7): 715-719
- **GENERATION OF ACOUSTIC-WAVES BY HARMONIC ELECTRIC-CURRENT SHEETS IN THE SEA** *JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA*
HARKER, K. J., FRASERSMITH, A. C.

-
- 1981; 69 (4): 970-973
- **SHORT-TERM PREDICTION AND A NEW METHOD OF CLASSIFICATION OF PC 1 PULSATION OCCURRENCES** *PLANETARY AND SPACE SCIENCE*
FRASERSMITH, A. C.
1980; 28 (7): 739-747
 - **PENINSULA METHOD OF ULF SIGNAL GENERATION** *NATURE*
FRASERSMITH, A. C., VILLARD, O. G.
1980; 286 (5770): 242-243
 - **STIMULATION OF PC-1 GEOMAGNETIC-PULSATIONS BY NATURALLY-OCCURRING REPETITIVE VLF ACTIVITY** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C., Helliwell, R. A.
1980; 7 (10): 851-853
 - **CORRELATION BETWEEN LAMBDA-4278-A OPTICAL-EMISSIONS AND A PC-1 PEARL EVENT OBSERVED AT SIPLE STATION, ANTARCTICA** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
Mende, S. B., Arnoldy, R. L., Cahill, L. J., Doolittle, J. H., ARMSTRONG, W. C., FRASERSMITH, A. C.
1980; 85 (NA3): 1194-1202
 - **ELF SPHERIC OCCURRENCES IN THE ANTARCTIC DURING A SOLAR PROTON EVENT - CASE-STUDY OF OCCURRENCES AT BYRD-STATION DURING THE EVENT OF JUNE 9, 1968** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
FRASERSMITH, A. C., Helliwell, R. A.
1980; 85 (NA5): 2296-2306
 - **ULF-ELF ELECTROMAGNETIC-FIELDS GENERATED ABOVE A SEA OF FINITE DEPTH BY A SUBMERGED VERTICALLY-DIRECTED HARMONIC MAGNETIC DIPOLE** *RADIO SCIENCE*
FRASERSMITH, A. C., BUBENIK, D. M.
1979; 14 (1): 59-74
 - **WEEKEND INCREASE IN GEOMAGNETIC-ACTIVITY** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
FRASERSMITH, A. C.
1979; 84 (NA5): 2089-2096
 - **LARGE-AMPLITUDE ULF MAGNETIC-FIELDS PRODUCED BY A RAPID TRANSIT SYSTEM - CLOSE-RANGE MEASUREMENTS** *RADIO SCIENCE*
Ho, A. M., FRASERSMITH, A. C., VILLARD, O. G.
1979; 14 (6): 1011-1015
 - **ULF-ELF ELECTROMAGNETIC-FIELDS GENERATED IN A SEA OF FINITE DEPTH BY A SUBMERGED VERTICALLY-DIRECTED HARMONIC MAGNETIC DIPOLE** *RADIO SCIENCE*
BUBENIK, D. M., FRASERSMITH, A. C.
1978; 13 (6): 1011-1020
 - **ULF TREE POTENTIALS AND GEOMAGNETIC PULSATIONS** *NATURE*
FRASERSMITH, A. C.
1978; 271 (5646): 641-642
 - **LARGE-AMPLITUDE ULF ELECTROMAGNETIC-FIELDS FROM BART** *RADIO SCIENCE*
FRASERSMITH, A. C., Coates, D. B.
1978; 13 (4): 661-668
 - **CHEVRON FREQUENCY STRUCTURE IN PC-1 GEOMAGNETIC PULSATIONS** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C.
1977; 4 (1): 53-56
 - **PREDOMINANCE OF EVEN AP-INDICES** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C., BUBENIK, D. M.
1976; 3 (2): 91-92

- **ULF-ELF MAGNETIC-FIELDS GENERATED AT SEA-SURFACE BY SUBMERGED MAGNETIC DIPOLES** *RADIO SCIENCE*
FRASERSMITH, A. C., BUBENIK, D. M.
1976; 11 (11): 901-913
- **CONTROLLED ARTIFICIAL GENERATION OF GEOMAGNETIC PULSATIONS** *NATURE*
LIPA, B. J., FRASERSMITH, A. C., VILLARD, O. G., Storey, J. R.
1975; 258 (5533): 311-313
- **INITIAL OBSERVATIONS OF ARTIFICIAL STIMULATION OF ULF PULSATIONS BY PULSED VLF TRANSMISSIONS** *GEOPHYSICAL RESEARCH LETTERS*
FRASERSMITH, A. C., Cole, C. A.
1975; 2 (4): 146-149
- **LONG-TERM PREDICTION OF PC1 GEOMAGNETIC PULSATION OCCURRENCES** *PLANETARY AND SPACE SCIENCE*
LEE, D. T., FRASERSMITH, A. C.
1975; 23 (3): 431-436
- **SUPERCONDUCTING MAGNETOMETER MEASUREMENTS OF GEOMAGNETIC ACTIVITY IN 0.1- TO 14-HZ FREQUENCY RANGE** *JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS*
FRASERSMITH, A. C., Buxton, J. L.
1975; 80 (22): 3141-3147
- **EFFECT OF CONDUCTING EARTH ON MICROPULSATION-GENERATING CAPABILITY OF A GROUND-BASED CURRENT LOOP** *JOURNAL OF GEOPHYSICAL RESEARCH*
FRASERSMITH, A. C., BUBENIK, D. M.
1974; 79 (7): 1038-1045