Francis Nimmo

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RESEARCH INTERESTS

Origin and evolution of solid body surfaces and interiors from observations and geophysical modelling.

RESEARCH ACHIEVEMENTS

- Used gravity and topography to probe the internal structures of Titan, Rhea, Enceladus and the Moon
- Proposed reorientation to explain the locations of the hot spot on Enceladus and Sputnik Planitia on Pluto
- Proposed a link between plate tectonics and the presence/absence of a dynamo on Mars, Venus and the Earth

EMPLOYMENT

2011-	Professor, UCSC
2007-2011	Associate Professor, UCSC
2005-2007	Assistant Professor, UCSC
2002-2005	Adjunct Assistant Professor, UCLA
2001-2004	Royal Society University Research Fellow, University College London
1999-2001	Visitor, California Institute of Technology
1998-2001	Junior Research Fellow, Magdalene College, Cambridge University
1997-1998	Post-doctoral research assistant, Cambridge University

EDUCATION

1993-1996	Ph.D. Volcanism and tectonics on Venus, Cambridge University
1990-1993	BA Geological sciences (1st class honours), Cambridge University

AWARDS

2024	Elected a Fellow of the Royal Society (UK)
2020	Elected to the US National Academy of Sciences
2019	Harold Jeffreys lectureship, Royal Astronomical Society
2018	Paolo Farinella prize
2015	Overseas visiting scholarship, St John's College, Cambridge
2011	Japan Society for the Promotion of Science (JSPS) Visiting Fellow
2011	Merle A. Tuve Visiting Fellow, Carnegie Institute of Washington
2007	Macelwane medal, American Geophysical Union
2007	Urey prize, Division of Planetary Sciences, American Astronomical Society
2001	President's Award, Geological Society of London
1993-1996	Shell PhD Scholarship

SPACECRAFT MISSION INVOLVEMENT

2018-2022	*InSight* Participating Scientist
2015-present	Member on E-THEMIS, REASON, EIS and Radio Science teams for *Europa Clipper*
2014-2020	*New Horizons* embedded collaborator
2012-2017	*Cassini* Participating Scientist
2012-2016	GRAIL Participating Scientist

SELECTED PROFESSIONAL ACTIVITIES

2022-present Planetary sub-section lead, National Academies' Section 16 (Geophysics)
2022-present Team member on four *New Frontiers* spacecraft mission proposals
2022 External Review Committee, Weizmann Institute, Israel
2021-2023 Steering Committee Member, National Academies' Planetary Decadal Survey
2019-present Editor, *AGU Advances*
2018-2021 *InSight* Data Processing Working Group Chair.
2016-2019 Editor, *Icarus*
2015-2017 Interiors Working Group Co-Chair, *Europa Clipper*
2014 External Review Committee, Purdue Earth, Atmos. & Planetary Sciences Dept.
2009-2011 National Academies' Planetary Decadal Survey member (Satellites panel)
2008-2011 NASA Joint Jupiter Science Definition Team
2007 NASA Enceladus Science Definition Team
2006-2009 Member, National Academies' Committee on Planetary and Lunar Exploration
2003-2015 Associate Editor, *J. Geophys. Res. Planets*
2003-present Series Editor, Cambridge University Press Planetary Science series

RECENT INVITED TALKS/SEMINARS

2025 Lawrence Livermore National Lab; Kyoto Univ, Japan (remote); Oxford (UK) Dept. Earth Sciences; Stanford Dept. Geophysics; USC (scheduled); Yale (scheduled)

2024 Peking University, China; Observatoire de Paris; 39th Space Symposium (Boulder); UT Austin Institute for Geophysics; South-West Research Institute; MIT EAPS

2023 ETH Zurich; Marseille Galilean Satellites meeting (keynote); Juno Galilean Satellites workshop; IUGG, Berlin (keynote); UCLA Earth & Space Sciences; Enceladus Focus Group; Caltech Geological & Planetary Sciences

2022 Max Planck Institute, Goettingen; Multi-Messenger Tomography of the Earth meeting (remote); Breakthrough Discuss (novel spacecraft architectures); ISSI Berne workshop on Saturn dissipation (remote); Princeton icy moons workshop (remote)

2021 KISS Institute workshop on geodesy (remote); Habitable Worlds conference (remote)

2020 Caltech Geological & Planetary Sciences; Weizmann Institute & Hebrew University, Israel; Rocky Worlds, Cambridge UK

2019 Macau State Key Laboratory for Planetary Sciences, China; U.C. Berkeley Dept. Earth & Planetary Sciences; South-West Research Institute, Colorado; Pluto After New Horizons, Applied Physics Laboratory; NASA Ames Research Centre; Stony Brook University Dept. Geosciences; American Museum of Natural History; University of British Columbia, Dept. Earth, Ocean & Atmos. Sciences

PHD STUDENTS/POSTDOCS ADVISED

Students: Reid Parsons, Erinna Chen, Charles Barnhart, Tina Dwyer, Naor Movshovitz, Doug Hemingway, Carver Bierson, Jack Conrad, Nick Zube, Coby Abrahams, Szilard Gyalay, Brynna Downey, Nathan McGregor, Ryu Akiba, Chelsea Eakins

Post-docs: James Roberts, Ke Zhang, Guillaume Robuchon, Jonathan Besserer, Shun Kamata, ZhenLiang Tian, Laurent Pou, Ben Idini

PUBLICATIONS ($^{+}$ indicates graduate student, ^ post-doc)

[284] Thermal asymmetry in the Moon`s mantle inferred from monthly tidal response, R.S. park, A. Berne, A.S. Konopliv, J.T. Keane, I. Matsuyama, **F. Nimmo** et al., *Nature* 641, 1188-1192, 2025.

[283] Origin of moderately volatile elements in Earth inferred from mass-dependent Ge isotope variations among chondrites, E. Wolfer, C. Burkhardt, **F. Nimmo**, T. Kleine, *Earth Planet. Sci. Lett.* 663, 119435, 2025.

[282] Surfaces, interiors and evolution of solar system moons, **F. Nimmo**, *Proc. R. Soc. A* 481, 2321, 2025.

[281] Probing the viscosity of Venus`s mantle from dynamic topography at Baltis Vallis, [+]N.J. McGregor, **F. Nimmo**, C. Gillmann et al., *J. Geophys. Res.* 103, e2024JE008581, 2025.

[280] Titan`s spin state as a constraint on tidal dissipation, [+]B.G. Downey, **F. Nimmo**, *Science Advances* 11, eadl4741, 2025.

[279] Io`s tidal response precludes a shallow magma ocean, R.S. Park, R.A. Jacobson, L. Gomez Casajus, **F. Nimmo** et al., *Nature* 638, 69-73, 2025.

[278] Did the terrestrial planets of the solar system form by pebble accretion? A. Morbidelli, T. Kleine, **F. Nimmo**, *Earth Planet. Sci. Lett.* 650, 119120, 2025.

[277] A potential mushy source for the geyers of Enceladus and other icy satellites, C.R. Meyer, J.J. Buffo, **F. Nimmo** et al., *Geophys. Res. Lett.* 52, e2024GL11129, 2025.

[276] Pluto and Triton: Interior structures, lithospheres and potential for oceans, **F. Nimmo**, C. Bierson, W.B. McKinnon, in *Triton and Pluto: The long-lost twins of active worlds*, IOP Publishing, 2025.

[275] Tidally driven remelting around 4.35 billion years ago indicates the Moon is old, **F. Nimmo**, T. Kleine, A. Morbidelli, *Nature* 636, 598-602, 2024.

[274] Mechanisms and timing of carbonaceous chondrite delivery to the Earth, **F. Nimmo**, T. Kleine, A. Morbidelli, D. Nesvorny, *Earth Planet. Sci. Lett*. 648, 119112, 2024.

[273] Looking for subsurface oceans within the moons of Uranus using librations and gravity, D.J. Hemingway, **F. Nimmo**, *Geophys. Res. Lett.* 51, e2024GL110409, 2024.

[272] Dual-frequency electromagnetic sounding of a Triton ocean from a single flyby, K. Khurana, J. Liu, J. Castillo-Rogez, C. Cochrane, **F. Nimmo**, L.M. Prockter, *Phil. Trans. R. Soc.* A 382, 2286, 2024.

[271] A lunar core dynamo limited to the Moon`s first ~140 million years, T. Zhou, J.A. Tarduno, R.D. Cottrell et al., *Nature Communications Earth & Environment* 5, 456, 2024.

[270] Magnetization and age of ca. 544 Ma syenite, eastern Canada: Evidence for renewal of the geodynamo, T. Zhou, M. Ibanez-Meijia, R.K. Bono et al., *Earth Planet. Sci. Lett.* 639, 118758. 2024.

[269] Science overview of the Europa Clipper mission, R.T. Pappalardo, B.J. Buratti, H. Korth et al. *Space Sci. Rev.* 220, 1-58, 2024.

[268] Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON), D.D. Blankenship, A. Moussessian, E. Chapin et al., *Space Sci. Rev.* 220, 51, 2024.

[267] The Europa Thermal Imaging system (E-THEMIS) investigation for the Europa Clipper mission, P.R. Christensen, J.R. Spencer, G.L. Mehall et al., *Space Sci Rev*. 220, 1-62, 2024.

[266] Origin of the Earth, T. Kleine, **F. Nimmo**, in *Treatise of Geochemistry*, 2nd ed., in press, 2024.

[265] Magnetization and age of ca. 544 Ma syenite, eastern Canada: Evidence for renewal of the geodynamo, T. Zhou, M. Ibanez-Meija, R.K. Bono, R.D. Cottrell, W. Bleeker, K.P. Kodama, W. Huang, E.G. Blackman, **F. Nimmo**, Al.V Smirnov, J.A. Tarduno, *Earth Planet. Sci. Lett.* 639, 118758, 2024.

[264] Isotopic evidence of long-lived volcanism on Io. K. de Kleer, E.C. Hughes, **F. Nimmo**, J. Eiler, A.E. Hofmann, S. Luszcz-Cook, K. Mandt, *Science* 384, eadj0625, 2024.

[263] Using Io's sulfur isotope cycle to understand the history of tidal heating, E.C. Hughes, K. de Kleer, J. Eiler, **F. Nimmo**, K. Mandt, A.E. Hoffmann, *J. Geophys. Res.* 129, e2023JE008086, 2024.

[262] Probing the rock mass fraction and transport efficiency inside Uranus using ^{40}Ar measurements, **F. Nimmo**, J.I. Lunine, K. Zahnle, L. Stixrude, *Planet. Sci. J.* 5, 109, 2024.

[261] Io's long-wavelength topography as a probe for a subsurface magma ocean, [+]S. Gyalay, **F. Nimmo**, *Geophys. Res. Lett.* 51, e2023GL106993, 2024.

[260] Effect of transient obliquity tides within Mimas's warm, icy interior preserved as a frozen fossil figure, [+]S. Gyalay, **F. Nimmo**, [+]B.G. Downey, *J. Geophys. Res.* 129, e2023JE007903, 2024.

[259] Long-term evolution of the Saturnian system, M. Cuk, M. El Moutamid, G. Lari, M. Neveu, **F. Nimmo,** B. Noyelles, A. Rhoden, M. Saillenfest, *Space Sci. Rev.* 220, 20, 2024.

[258] Leveraging the gravity field spectrum for icy satellite interior structure determination: The case of Europa with the Europa Clipper mission, G. Cascioli, E. Mazarico, A.J. Dombard, **F. Nimmo**, *Planet. Sci. J.* 5, 45, 2024.

[257] The global shape, gravity field and libration of Enceladus, R.S. Park et al., *J. Geophys. Res.* 129, e2023JE008054, 2024.

[256] Resonant stratification in Titan's global ocean, ^B. Idini, **F. Nimmo**, *Planet. Sci. J.* 5, 15, 2024.

[255] Tidal dissipation of binaries in asteroid pairs, ^L. Pou, **F. Nimmo**, *Icarus* 411, 115919, 2024.

[254] Strong tidal dissipation at Uranus? **F. Nimmo**, *Planet. Sci. J.* 4, 241, 2023

[253] Lunar magnetism, M.A. Wieczorek et al., *Rev. Min. Geochem*. 89, 207-241, 2023.

[252] The internal structure of Eris inferred from its spin and orbit evolution, **F. Nimmo**, M. Brown, *Science Advances* 9, 9201, 2023.

[251] The topography of Ganymede, P. Schenk, W. McKinnon, J. Moore, **F. Nimmo**, in *Ganymede,* M. Volwerk et al., eds., Cambridge Univ. Press pp. 126-146, 2023.

[250] Exploring the interior of Europa with the Europa Clipper, J.H. Roberts, W.B. McKinnon, C.M. Elder et al., *Space Sci. Rev.* 219, 46, 2023.

[249] Origin and evolution of Enceladus's tidal dissipation, **F. Nimmo**, M. Neveu, C. Howett, *Space Sci. Rev.* 219, 57, 2023.

[248] Hadean to Palaeoarchaean stagnant-lid tectonics revealed by zircon magnetism, J.A. Tarduno, R.D. Cottrell, R.K. Bono, N. Rayner, W.J. Davis, T.H. Zhou, **F. Nimmo**, A. Hofmann, J. Jodder, M. Ibanez-Mejia, M.K Wattkeys, H. Oda, G. Mitra, *Nature* 618, 531-534, 2023.

[247] Variations in lunar elastic thickness from admittance spectral analysis, [+]R.E. Maxwell, **F. Nimmo**, *Icarus* 403, 2023.

[246] True polar wander of lava worlds, W.Y. Kang, **F. Nimmo**, F. Ding, *Astrophys. J. Lett.* 949, 2023.

[245] Non-synchronous rotation on Europa driven by ocean currents, Y. Ashkenazy, E. Tziperman, **F. Nimmo,** *AGU Advances* 4, 2023.

[244] The Europa Clipper gravity and radio science investigation, E. Mazarico, D. Buccino, J. Castillo-Rogez, A.J. Dombard, A. Genova, H. Hussmann, W.S. Kiefer, J.I. Lunine, W.B. McKinnon, **F. Nimmo**, R.S. Park, J.H. Roberts, D.K Srinivasan, G. Steinbruegge, P. Tortora, P. Withers, *Space. Sci. Rev*. 219, 2023.

[243] Constraining characteristic morphological wavelengths for Venus using Baltis Vallis, [+]J.W. Conrad, **F. Nimmo**, *Geophys. Res. Lett.* 50, 2023.

[242] Estimates for Tethys' moment of inertia, heat flux distribution and interior structure from its long-wavelength topography, [+]S. Gyalay, **F. Nimmo**, *J. Geophys. Res.* 128, 2023.

[241] An inner solar system origin of volatile elements in Mars, T. Kleine, T. Steller, C. Burkhardt, **F. Nimmo**, *Icarus* 397, 115519, 2023.

[240] Viscous relaxation as a probe of heat flux and crustal plateau composition on Venus, **F. Nimmo**, S.J. Mackwell, *Proc. Nat. Acad. Sci.* 120 e2216311120, 2023.

[239] The thermal-orbital evolution of the Earth-Moon system with a subsurface magma ocean and fossil figure, [+]B.G. Downey, **F. Nimmo**, I. Matsuyama, *Icarus*, 389, 115257, 2023.

[238] Tidal heating in Io, I.N. Matsuyama, T. Steinke, **F. Nimmo**, *Elements,* 18, 374-378, 2022.

[237] Loss of a satellite could explain Saturn's obliquity and young rings , J. Wisdom, R. Dbouk, B. Militzer, W.B. Hubbard, **F. Nimmo**, [+]B.G. Downey, R.G. French, *Science*, 377, 1285-1289, 2022.

[236] Tidal constraints on the Martian interior , ^L. Pou, **F. Nimmo**, A. Rivoldini, A. Khan, A. Bagheri, T. Gray, H. Samuel, P. Lognonne, A.-C. Plesa, T. Gudkova, D. Giardini, *J. Geophys. Res. Planets*, 127 e2022JE007921, 2022.

[235] Assessing the detectability of Europa's seafloor topography from Europa Clipper's gravity data, [+]Z.-W. Koh, **F. Nimmo**, J.I. Lunine, E. Mazarico, A.J. Dombard, *Planetary Science Journal* 3, 197, 2022.

[234] Early Cambrian renewal of the geodynamo and the origin of inner core structure, T. Zhou, J.A. Tarduno, **F. Nimmo**, R.D. Cottrell, R.K. Bono, M. Ibanez-Mejia, W. Huang, M. Hamilton, K. Kodama, A.V. Smirnov, B. Crummins, F. Padgett, *Nature Communications*, https://doi.org/10.1038/s41467-022-31677-7, 2022

[233] InSight constraints on the global character of the Martian crust, M.A. Wieczorek, A. Broquet, S.M. McLennan, A. Rivoldini, M. Golombek, D.Antonangeli, C. Beghein, D. Giardini, T. Gudkova, S. Gyalay, C.L. Johnson, R.Joshi, D. Kim, S. D. King, B. Knapmeyer-Endrun, P. Lognonne, C. Michaut, A. Mittelholz, **F. Nimmo**, L. Ojha, M. Panning, A.-C. Plesa, M.A. Siegler, S.E. Smrekar, T. Spohn, W.B. Banerdt, *J. Geophys. Res.*, 127, e2022JE007298, 2022.

[232] The tides of Enceladus' porous core, M. Rovira-Navarro, R.F. Katz, Y. Liao, W. van der Wal, **F. Nimmo**, *J. Geophys. Res.*, 127, e2021JE007117, 2022.

[231] 25 years of planetary surprises , **F. Nimmo**, *Astron. Geophys.* , 63, 2, 2022.

[230] Formation, composition and evolution of the Earth's core , **F. Nimmo**, *Oxford Research Encyclopedia of Planetary Science*,https://doi.org/10.1093/acrefore/9780190647926.013.204, 2022.

[229] An investigation of libration heating and the thermal state of Enceladus's ice shell , [+]W. Shao and **F. Nimmo**, *Icarus* 373 , 114769, 2022.

[228] A note on the possibility of subsurface oceans on the Uranian satellites , C.J. Bierson, **F. Nimmo**, *Icarus* 373

[227] Geodynamics of Pluto , **F. Nimmo**, W.B. McKinnon, in *The Pluto system after New Horizons*, S.A. Stern et al., eds, Univ. Ariz. Press., pp.89-103, 2021

[226] The Geology and geophysics of Charon, J. Spencer, R.A. Beyer, S.J. Robbins, K.N. Singer, **F. Nimmo**, in *The Pluto System after New Horizons*, S.A. Stern et al., eds, Univ. Ariz. Press, pp. 395-412, 2021.

[225] Nucleosynthetic Pt isotope anomalies and the Hf-W chronology of core formation in inner and outer solar system planetesimals, F. Spitzer, C. Burkhardt, **F. Nimmo**, T. Kleine, *Earth. Planet. Sci. Lett.* 576 117211, 2020.

[224] The origin of the Moon's Earth-like tungsten isotopic composition from dynamical and geochemical modeling, R.A. Fischer, [+]N.G. Zube, **F. Nimmo**, *Nature Comm.* 12, 2021.

[223] Timing of Martian core formation from models of Hf-W evolution coupled with N-body simulations, M.C. Brennan, R.A. Fischer, **F. Nimmo**, D.P. O'Brien, *Geochim. Cosmochim. Acta*, 316, 295-308, 2021

[222] Improved determination of Europa's long-wavelength topography using stellar occultations, [+]J.N.H. Abrahams, **F. Nimmo**, T.M. Becker, G.R. Gladstone, K.D. Retherford, G. Steinbruegge, E. Mazarico, *Earth and Space Science*, 8, e2020EA001586, 2021.

[221] Forward modeling of the Phobos tides and applications to the first Martian year of the InSight mission, ^L. Pou, **F. Nimmo**, P. Lognonne, D. Mimoun, R.F. Garcia, B. Pinot, A. Rivoldini, D. Banfield, W.B. Banerdt, *Earth and Space Science*, 8, e2021EA001669, 2021.

[220] Oxygen false positives on habitable zone planets around Sun-like stars , J. Krissansen-Totton, J.J. Fortney, **F. Nimmo**, N. Wogan, *AGU Advances*, 2, e2020AV000294, 2021.

[219] Updated Europa gravity field and interior structure from a reanalysis of Galileo tracking data, L.G. Casajus, M. Zannoni, D. Modenini, P. Tortora, **F. Nimmo**, T. Van Hoolst, D. Buccino, K. Oudrhiri, *Icarus* 358, 114187, 2021.

[218] Heat flux constraints from variance spectra of Pluto and Charon using limb profile topography, [+]J.W. Conrad, **F. Nimmo**, R.A. Beyer, C.J. Bierson, P.M. Schenk, *J. Geophys. Res.* 126, e2020JE006641, 2021.

[217] Radiogenic heating and its influence on rocky planet dynamos and habitability, **F. Nimmo**, J. Primack, S.M. Faber, E. Ramirez-Ruiz, M. Safarzadeh, *Astrophys. J. Lett.*, 903, L37, 2020.

[216] Inclination damping on Callisto, [+]B.G. Downey, **F. Nimmo**, I. Matsuyama, *Mon. Not. R. Astron. Soc.*, 499, 40-51, 2020

[215] Explaining the Galilean satellites' density gradient by hydrodynamic escape, [+]C.J. Bierson, **F. Nimmo**, *Astrophys. J. Lett.*, 897, L43, 2020.

[214] Astronomical context of Solar System formation from molybdenum isotopes in meteorite inclusions , G.A. Brennecka, C. Burkhardt, G. Budde, T.S. Kruijer, **F. Nimmo**, T. Kleine, *Science*, 370, 837-839, 2020.

[213] Detection, analysis and removal of glitches from InSight's seismic data from Mars , J.-R. Scholz, R. Widmer-Schnidrig, P. Davis, P. Lognonne, B. Pinot, R.F. Garcia, K. Hurst, ^L. Pou, **F. Nimmo**, S. Barkaoui et al. *Earth Space Sci.* 7, e2020EA001317, 2020.

[212] A very young age for true polar wander on Europa from related fractures, P.M. Schenk, I. Matsuyama, **F. Nimmo**, *Geophys. Res. Lett.* doi:10.1029/2020GL088364, 2020.

[211] Heat production and tidally-driven fluid flow in the permeable core of Enceladus, Y. Liao, **F. Nimmo**, J.A. Neufeld, *J. Geophys. Res.*, doi:10.1029/2019JE006209, 2020.

[210] Constraints on thermal history of Mars from depth of pore closure below InSight, [+]S. Gyalay, **F. Nimmo**, A.-C. Plesa, M. Wieczorek, *Geophys. Res. Lett.*, doi:10.1029/2020GL088653, 2020.

[209] The librations, tides and interior structure of Io, T. Van Hoolst, R.-M. Baland, A. Trinh, M. Yseboodt, **F. Nimmo**, *J. Geophys. Res.*, doi:10.1029/2020JE006473, 2020.

[208] Evidence for a hot start and early ocean formation on Pluto, [+]C.J. Bierson, **F. Nimmo**, S.A. Stern, *Nature Geosci.*, 13, 468-472, 2020

[207] The Non-Carbonaceous--Carbonaceous meteorite dichotomy, T. Kleine, G. Budde, C. Burkhardt, T.S. Kruijer, E.A. Worsham, A. Morbidelli, **F. Nimmo**, *Space Sci. Rev.* 216, 55, 2020.

[206] The seismicity of Mars, D. Giardini, P. Lognonne, W.B. Banerdt et al., *Nature Geosci.*, 13, 205-209, 2020.

[205] Initial results from the InSight mission on Mars, W.B. Banerdt, S.E. Smrekar, D. Banfield et al. *Nature Geosci.*, 13, 183-186, 2020.

[204] Constraints on the shallow elastic and anelastic structure of Mars from InSight seismic data , P. Lognonne, W.B. Banerdt, W.T. Pike et al., *Nature Geosci.* 13, 213-216, 2020.

[203] Paleomagnetism indicates that primary magnetite in zircon records a strong Hadean geodynamo, J.A. Tarduno, R.D. Cottrell, R.K. Bonon, H. Oda, W.J. Davis, M. Fayek, O. van't Erve, **F. Nimmo**, W. Huang, E.R. Thern, S. Fearn, *Proc. Nat. Acad. Sci.* 117 2309-2318, 2020.

[202] The Pluto system after New Horizons, J.R. Spencer, W.M. Grundy, **F. Nimmo**, L.A. Young, in *The Trans-Neptunian Solar System* , Prialnik, Barucci, Young eds., Elsevier, pp. 271-288, 2020.

[201] Implications of second-order resonance for the thermal and orbital evolution of Mimas, ^Z. Tian, **F. Nimmo**, *Mon. Not. R. Astron. Soc.* 492, 369-376, 2020

[200] Variability in Io's volcanism on timescales of periodic orbital changes, K. de Kleer, **F. Nimmo**, E. Kite, *Geophys. Res. Lett.* , 46, https://doi.org/10.1029/2019GL082691, 2019.

[199] Constraints on asteroid magnetic field evolution and the radii of meteorite parent bodies from thermal modelling, J.F.J. Bryson, J.A. Neufeld, **F. Nimmo**, *Earth Planet. Sci. Lett.* 521, 68-78, 2019.

[198] Constraints on terrestrial planet formation timescales and equilibration processes in the Grand Tack scenario from Hf-W isotopic evolution, N.G. Zube[+], **F. Nimmo**, R.A. Fischer, S.A. Jacobson, *Earth Planet. Sci. Lett.* 522, 210-218, 2019.

[197] An upper bound on Pluto's heat flux from a lack of flexural response of its normal faults, J.W. Conrad[+], **F. Nimmo**, P. Schenk et al., *Icarus* 328, 210-217, 2019.

[196] Using the density of Kuiper Belt Objects to constrain their composition and formation history, C.J. Bierson[+], **F. Nimmo**, *Icarus*, 326, 10-17, 2019.

[195] Pluto's ocean is capped and insulated by gas hydrates. S. Kamata, **F. Nimmo**, Y. Sekine et al. *Nature Geoscience* 12, 407-410, 2019.

[194] Ferrovolcanism: iron volcanism on metallic asteroids. J.A.N.H. Abrahams[+], **F. Nimmo**. *Geophys. Res. Lett.* 46, 5055-5064, 2019.

[193] The top-down solidification of iron asteroids driving dynamo evolution. J.A. Neufeld, J.F.J. Bryson, **F. Nimmo**. *J. Geophys. Res.* 124, 1331-1356, 2019.

[192] Near-equilibrium isotope fractionation during planetesimal evaporation, E.D. Young, A. Shahar, **F. Nimmo**, H.E. Schlichting, E.A. Schauble, H. Tang, J. Labidi, *Icarus* 323 1-15, 2019.

[191] The nature and origin of Charon's smooth plains, R.A. Beyer, J.R. Spencer, W.B. McKinnon, **F. Nimmo** et al. *Icarus* 323 , 16-32, 2019.

[190] Origin of the non-carbonaceous-carbonaceous meteorite dichotomy, J.A.M. Nanne, **F. Nimmo**, J.N. Cuzzi, T. Kleine, *Earth Planet. Sci. Lett.* 511 , 44-54, 2019.

[189] Tidal dissipation in rubble-pile asteroids **F. Nimmo**, I. Matsuyama, *Icarus* , 321, 715-721, 2019.

[188] Young inner core inferred from Ediacaran ultra-low geomagnetic field intensity, R.K. Bono, J.A. Tarduno, **F. Nimmo**, R.D. Cottrell, *Nature Geosci.* 12 143-147, 2019.

[187] Lunar impact history constrained by GRAIL-derived basin relaxation measurements J.W. Conrad[+], **F. Nimmo**, C.I. Fassett, S. Kamata, *Icarus* , 314 , 50-63, 2018.

[186] The thermal and orbital evolution of Enceladus: observational constraints and models **F. Nimmo**, A.C. Barr, M. Behounkova, W.B. McKinnon, in *Enceladus and the icy moons of Saturn*, P.M. Schenk, R.N. Clark, C.J.A. Howett, A.J. Verbiscer, J.H. Waite, eds., Univ. Ariz. Press, pp.79-94, 2018.

[185] Plume origins and plumbing: from ocean to surface J.R. Spencer, **F. Nimmo**, A.P. Ingersoll, T.A. Hurford, E.S. Kite, A.R. Rhoden, J. Schmidt, C.J.A. Howett, in *Enceladus and the icy moons of Saturn* P.M. Schenk, R.N. Clark, C.J.A. Howett, A.J. Verbiscer, J.H. Waite, eds., Univ. Ariz. Press, pp. 163-174, 2018.

[184] Effects of core formation on the Hf-W isotopic composition of the Earth and dating of the Moon-forming impact, R.A. Fischer, **F. Nimmo**, *Earth Planet. Sci. Lett.* , 499, 257-265, 2018.

[183] Ocean heating in icy satellites with solid shells I. Matsuyama, M. Beuthe, H.C.F. Hay, **F. Nimmo**, S. Kamata *Icarus* , 312, 208-230, 2018.

[182] Constraints on lunar crustal porosity from the gravitational signature of impact craters M. Ding, J.M. Soderblom, C.J. Bierson[+] et al. *J. Geophys. Res. Planets* , 123 , 2281-2294, 2018.

[181] Transforming dust to planets **F. Nimmo**, K. Kretke, S. Ida, S. Matsumura, T. Kleine in *Space Sci. Rev.* 214, 2018.

[180] Implications of the observed Pluto-Charon density contrast C.J. Bierson[+], **F. Nimmo**, W.B. McKinnon *Icarus* , 309, 207-219, 2018.

[179] Dunes on Pluto M.W. Telfer, E.J.R. Parteli, J. Radebaugh, R.A. Beyer, T. Bertrand, F. Forget, **F. Nimmo** et al. *Science* , 360, 992-997, 2018.

[178] A geophysical perspective on the bulk composition of Mars A. Khan, C. Liebske, A. Rozel, A. Rivoldini, **F. Nimmo**, J.A.D. Connolly, A.-C. Plesa, D. Giardini, *J. Geophys. Res. Planets* , 123, 575-611, 2018.

[177] Radial mixing and Ru-Mo isotope systematics under different accretion scenarios R.A. Fischer, **F. Nimmo**, D.P. O'Brien *Earth Planet. Sci. Lett.* , 482 105-114, 2018.

[176] Magnesium isotope evidence that accretional vapour loss shapes planetary compositions, R.C. Hin, C.D. Coath, P.J. Carter, **F. Nimmo**, Y-J. Lai, P.A.E. Pogge von Strandmann, M. Willbold, Z. Leinhardt, M.J. Walter, T. Elliott, *Nature* , 549 511-515, 2017.

[175] Global drainage patterns and the origins of topographic relief on Earth, Mars and Titan, B.A. Black, J.T. Perron, D. Hemingway, E. Bailey, **F. Nimmo**, H. Zebker *Science* , 356 727-731, 2017.

[174] Charon tectonics, R.A. Beyer, **F. Nimmo**, W.B. McKinnon, J.M. Moore et al. *Icarus* , 287 161-174, 2017.

[173] Origin of the Pluto-Charon system: Constraints from the New Horizons flyby, W.B. McKinnon, S.A. Stern, H.A. Weaver, **F. Nimmo** et al. *Icarus* , 287 2-11, 2017.

[172] Interior thermal state of Enceladus inferred from the viscoelastic state of the ice shell, S. Kamata, **F. Nimmo** *Icarus* , 284 387-393, 2017.

[171] Reorientation of Sputnik Planitia implies a subsurface ocean on Pluto, **F. Nimmo**, D.P. Hamilton, W.B. McKinnon, P.M. Schenk, R.P. Binzel, C.J. Bierson^{+}, R.A. Beyer, J.M. Moore, S.A. Stern, H.A. Weaver, C.B. Olkin, L.A. Young, K.E. Smith, *Nature* , 540 94-96, 2016.

[170] Formation of Charon's red poles from seasonally cold-trapped volatiles, W.M. Grundy, D.P. Cruikshank, G.R. Gladstone et al., *Nature* 539, 65-68, 2016.

[169] A test for Io's magma ocean: modeling tidal dissipation with a partially-molten mantle, C.J. Bierson^{+}, **F. Nimmo** *J. Geophys. Res.* , 121 2211-2224, 2016.

[168] Gravity field of the Orientale basin from the Gravity Recovery and Interior Laboratory mission, M.T. Zuber, D.E. Smith, G.A. Neumann, S. Goossens, J.C. Andrews-Hanna, J.W. Head, W.S. Kiefer, S.W. Asmar, A.S. Konopliv, F.G. Lemoine, I. Matsuyama, H.J. Melosh, P.J. McGovern, **F. Nimmo**, R.J. Phillips, S.C. Solomon, G.J. Taylor, M.M. Watkins, M.A. Wieczorek, J.G. Williams, J.C. Jansen, B.C. Johnson, J.T. Keane, E. Mazarico, K. Miljkovic, R.S. Park, J.M. Soderblom, D.N. Yuan, *Science* , 354 438-441, 2016.

[167] Formation of the Orientale lunar multiring basin, B.C. Johnson, D.M. Blair, G.S. Collins, H.J. Melosh, A.M. Freed, G.J. Taylor, J.W. Head, M.A. Wieczorek, J.C. Andrews-Hanna, **F. Nimmo**, J.T. Keane, K. Miljkovic, J.M. Soderblom, M.T. Zuber *Science* , 354 441-444, 2016.

[166] Ocean worlds in the outer solar system, **F. Nimmo**, R.T. Pappalardo *J. Geophys. Res.* , 121 1378-1399, 2016.

[165] Interactions between complex craters and the lunar crust: Analysis using GRAIL data C.J. Bierson^, R.J. Phillips, **F. Nimmo**, J. Besserer^, C. Milbury, J.T. Keane, J.M. Soderblom, M.T. Zuber *J. Geophys. Res.,* 121 1488-1497, 2016.

[164] GRAIL, LLR and LOLA constraints on the interior structure of the Moon I. Matsuyama, **F. Nimmo**, J.T. Keane, N.H. Chan, G.J. Taylor, M.A. Wieczorek, W.S. Kiefer, J.G. Williams *Geophys. Res. Lett.* 43 8365-8375, 2016.

[163] Tidal deformation of Ganymede: Sensitivity of Love numbers on the interior structure S. Kamata, J. Kimura, K. Matsumoto, **F. Nimmo**, K. Kuramoto, N. Namiki *J. Geophys. Res.,* 121 1362-1375, 2016.

[162] An early geodynamo driven by exsolution of mantle components from Earth's core, J. Badro, J. Siebert, **F. Nimmo**, *Nature* 536, 326-328, 2016.

[161] Impact-induced melting during accretion of the Earth, J. de Vries, **F. Nimmo**, H.J. Melosh, S.A. Jacobson, A. Morbidelli, D.C. Rubie, *Progress Earth Planet. Sci.* 3, 7, 2016.

[160] Mean radius and shape of Pluto and Charon from New Horizons images **F. Nimmo**, O.M. Umurhan, C.M. Lisse, C.J. Bierson^, T.R. Lauer, M.W. Buie, H.B. Throop, J.A. Kammer, J.H. Roberts, W.B. McKinnon, A.M. Zangari, J.M. Moore, S.A. Stern, L.A. Young, H.A. Weaver, C.B. Olkin, K. Ennico and the NH GGI team, *Icarus,* 287, 12-29, 2017.

[159] Thicknesses of mare basalts on the Moon from gravity and topography S. Gong, M.A. Wieczorek, **F. Nimmo**, W.S. Kiefer, J.W. Head, C. Huang, D.E. Smith, M.T. Zuber *J. Geophys. Res.,* 121 854-870, 2016.

[158] Convection in a volatile nitrogen-ice-rich layer drives Pluto's geological vigour W.B. McKinnon, **F. Nimmo**, T. Wong, P.M. Schenk, O.L. White, J.H. Roberts, J.M. Moore, J.R. Spencer, A.D. Howard, O.M. Umurhan, S.A. Stern, H.A. Weaver, C.B. Olkin, L.A. Young, K.E. Smith and the NH GGI team, *Nature* 534, 82-85, 2016.

[157] Impact disruption of gravity-dominated bodies: new simulation data and scaling N. Movshovitz[+], **F. Nimmo**, D.G. Korycansky, E. Asphaug, J.M. Owen *Icarus* 275, 85-96, 2016.

[156] Tidal dissipation in the lunar magma ocean and its effect on the early evolution of the Earth-Moon system E.M.A. Chen[+], **F. Nimmo** *Icarus* 275, 132-142, 2016.

[155] The geology of Pluto and Charon through the eyes of New Horizons Moore, J.M. et al., *Science,* 351, 1284-1293, 2016.

[154] The small satellites of Pluto as observed by New Horizons Weaver, H.A. et al., *Science,* 351, 1281, 2016.

[153] Effects of mass transfer between Martian satellites on surface geology M. Nayak[+], **F. Nimmo**, B. Udrea, *Icarus* 267 220-231, 2016.

[152] Pallasite paleomagnetism: Quiescence of a core dynamo Nichols, C.I.O., J.F. Bryson, J. Herrero-Albillos, F. Kronast, **F. Nimmo**, R.J. Harrison, *Earth Planet. Sci. Lett.* 441103-112, 2016.

[151] The Pluto system: Initial results from its exploration by New Horizons S.A. Stern *et al.*, *Science* 350 292-297, 2015.

[150] Preimpact porosity controls the gravity signature of lunar craters C. Milbury, B.C. Johnson, H.J. Melosh, G.S. Collins, D.M. Blair, J.M. Soderblom, **F. Nimmo**, C.J. Bierson[+], R.J. Phillips, M.T. Zuber, *Geophys. Res. Lett.* 42, 9711-9716, 2015.

[149] Rhea gravity field and interior modeling from Cassini data analysis P. Tortora, M. Zannoni, D. Hemingway, **F. Nimmo**, R.A. Jacobson, L. Iess, M. Parisi *Icarus* 264 264-273, 2015.

[148] Early differentiation and core formation: Processes and timescales **F. Nimmo**, T. Kleine *AGU Geophysical Monograph v. 212, The Early Earth: Accretion and Differentiation* , pp. 83-102, 2015 .

[147] Tidal resonance in icy satellites with subsurface oceans S. Kamata, I. Matsuyama, **F. Nimmo** *J. Geophys. Res.* 120 doi:10.1002/2015JE004821, 2015.

[146] The fractured Moon: Production and saturation of porosity in the lunar highlands from impact cratering J.M. Soderblom, A.J. Evans, B.C. Johnson, H.J. Melosh, K. Miljkovik, R.J. Phillips, J.C. Andrews-Hanna, C.J. Bierson[+], J.W. Head, C. Milbury, G.A. Neumann, **F. Nimmo**, D.E. Smith, S.C. Solomon, M.M. Sori, M.A. Wieczorek, M.T. Zuber *Geophys. Res. Lett.* 42 6939-6944, 2015.

[145] Magnetic meteorites and the early solar system J.F.J. Bryson, **F. Nimmo**, R.J. Harrison *Astron. Geophys.* 56 36-42, 2015.

[144] A Hadean to Paleoarchean geodynamo recorded by single zircon crystals J.A. Tarduno, R.D. Cottrell, W.J. Davis, **F. Nimmo**, R.K. Bono, *Science* 349 521-524, 2015.

[143] Timing of water plume eruptions on Enceladus explained by interior viscosity structure M. Behounkova, G. Tobie, O. Cadek, G. Choblet, C. Porco, **F. Nimmo**, *Nature Geoscience* 8 601-604, 2015.

[142] Disruption and re-accretion of mid-sized moons during an outer Solar System Late Heavy Bombardment, [+]Movshovitz, N., **F. Nimmo**, D. Korycansky, E. Asphaug, J. Owen, *Geophys. Res. Lett.* 42 doi:10.1002/2014GL062133, 2015.

[141] Thermal and compositional evolution of the core, **F. Nimmo** *Treatise on Geophysics, Vol. 9*, pp. 201-219, 2015.

[140] Energetics of the core, **F. Nimmo** *Treatise on Geophysics, Vol. 8*, pp. 27-55, 2015.

[139] Formation of the Earth's core, D. C. Rubie, **F. Nimmo**, H.J. Melosh *Treatise on Geophysics, Vol. 9*, pp. 43-79, 2015 .

[138] Channel slope reversal near the Martian dichotomy boundary: Testing tectonic hypotheses A. Lefort, D.M. Burr, **F. Nimmo**, R.E. Jacobsen *Geomorphology* 240121-136, 2015.

[137] Seismological implications of a lithospheric low seismic velocity zone in Mars Y. Zheng, **F. Nimmo**, T. Lay, *Phys. Earth Planet. Inter.* 240 132-141, 2015.

[136] Elastic thickness and heat flux estimates for the Uranian satellite Ariel G. Peterson[+], **F. Nimmo**, P. Schenk, *Icarus* 250 116-122, 2015.

[135] Fast grain growth of olivine in liquid Fe-S and the formation of pallasites with rounded olivine grains G.F.D. Solferino, G.J. Golabek, **F. Nimmo**, M.W. Schmidt,*Geochim. Cosmochim. Acta* 162 259-275, 2015.

[134] Long-lived magnetism from solidification-driven convection on the pallasite parent body J.F.J. Bryson, C.I.O. Nichols, J. Herrera-Albillos, F. Kronast, T. Kasama, H. Alimadadi, G. van der Laan, **F. Nimmo**, R.J. Harrison, *Nature* 517 472-475, 2015.

[133] The relative timing of Lunar Magma Ocean solidification and the Late Heavy Bombardment inferred from highly degraded impact basin structures, S. Kamata, S. Sugita, Y. Abe, Y. Ishihara, Y. Harada, T. Morota, N. Namiki, T. Iwata, H. Hanada, H. Araki, K. Matsumoto, E. Tajika, K. Kuramoto, **F. Nimmo**, *Icarus* 250 492-503, 2015.

[132] Powering Triton's recent geological activity by obliquity tides: Implications for Pluto geology, **F. Nimmo**, J. R. Spencer, *Icarus* 246 2-10, 2015.

[131] Accretion and differentiation of the terrestrial planets with implications for the compositions of early-formed Solar System bodies and accretion of water D.C. Rubie, S.A. Jacobson, A. Morbidelli, D.P. O'Brien, E.D. Young, J. de Vries, F. Nimmo, H. Palme, D.J. Frost *Icarus* 248 89-108, 2015.

[130] Bulk chemical and Hf-W isotopic consequences of incomplete accretion during planet formation, C.A. Dwyer[+], **F. Nimmo**, J.E. Chambers, *Icarus* 245, 145-152, 2015.

[129] Enceladus, **F. Nimmo** and C. Porco, in *Encyc. Solar System*, T. Spohn, D. Breuer, T.V. Johnson, eds., pp. 851-860, Elsevier, 2014.

[128] Impact basin relaxation as a probe for the thermal history of Pluto S. Kamata^, **F. Nimmo**, *J. Geophys. Res.* 119, doi:10.1002/2014JE004679, 2014.

[127] GRAIL gravity constraints on the vertical and lateral density structure of the lunar crust, J. Besserer^, **F. Nimmo**, M.A. Wieczorek, R.C. Weber, W.S. Kiefer, P.J. McGovern, J.C. Andrews-Hanna, D.E. Smith, M.T. Zuber *Geophys. Res. Lett.* 41, doi:10.1002/2014GL060240, 2014.

[126] Decline of the lunar core dynamo, S.M. Tikoo, B.P. Weiss, W.S. Cassata, D.L. Shuster, J. Gattacceca, E.A. Lima, C. Suavet, **F. Nimmo**, M.D. Fuller *Earth Planet. Sci. Lett.*404, 89-97, 2014.

[125] Orbital apocenter is not a sufficient condition for HST/STIS detection of Europa's water vapor aurora, L. Roth, K.D. Retherford, J. Saur, D.F. Strobel, P.D. Feldman, M.A. McGrath, **F. Nimmo** *Proc. Nat. Acad. Sci.* 111, E5123-E5132, 2014.

[124] The tidal-rotational shape of the Moon and evidence for polar wander I. Garrick-Bethell, V. Perera, **F. Nimmo**, M.T. Zuber, *Nature* 512 181-184, 2014.

[123] Tidally-modulated eruptions on Enceladus: Cassini ISS observations and models **F. Nimmo**, C. Porco, C. Mitchell, *Astron. J.* 148 46, 2014.

[122] How the geysers, tidal stresses, and thermal emission across the south polar terrain of Enceladus are related, C. Porco, D. DiNino, **F. Nimmo**, *Astron. J.* 148 45, 2014.

[121] Lunar interior properties from the GRAIL mission, Williams, J. G., A. S. Konopliv, D. H. Boggs, R. S. Park, D.-N. Yuan, F. G. Lemoine, S. J. Goossens, E. Mazarico, **F. Nimmo**, R. C. Weber, S. W. Asmar, H. J. Melosh, G. A. Neumann, R. J. Phillips, D. E. Smith, S. C. Solomon, M. M. Watkins, M. A. Wieczorek, J. C. Andrews-Hanna, J. W. Head, W. S. Kiefer, I. Matsuyama, P. J. McGovern, G. J. Taylor, and M. T. Zuber, *J. Geophys. Res. Planets* 119 doi:10.1002/2013JE004559, 2014.

[120] A new stereo topographic map of Io: Implications for geology from global to local scales O. White, P. Schenk, **F. Nimmo**, T. Hoogenboom, *J. Geophys. Res.* 119, doi:10.1002/2013JE004591, 2014.

[119] Planetary reorientation, I. Matsuyama, **F. Nimmo**, J.X. Mitrovica *Ann. Rev. Earth Planet. Sci.* 42, 605-634, 2014.

[118] The gravity field and interior structure of Enceladus, L. Iess, D.J. Stevenson, M. Parisi, D. Hemingway[+], R.A. Jacobson, J.I. Lunine, **F. Nimmo**, J.W. Armstrong, S.W. Asmar, M. Ducci, P. Tortora *Science* 344, 78-80, 2014.

[117] Tidal heating in icy satellite oceans, E.M.A. Chen[+], **F. Nimmo**, G.A. Glatzmaier, *Icarus* 229, 11-30, 2014.

[116] Transient water vapor at Europa's South pole, L. Roth, J. Saur, K.D. Retherford, D.F. Strobel, P.D. Feldman, M.A. McGrath, **F. Nimmo** *Science* 343, 171-174, 2014.

[115] Dissipation at tidal and seismic frequencies in a melt-free, anhydrous Mars, **F. Nimmo**, U. H. Faul, *J. Geophys. Res.* 118, 2558-2569, 2013.

[114] A rigid and weathered ice shell on Titan, [+]Hemingway, D., **F. Nimmo**, H. Zebker, L. Iess, *Nature* 500, 550-552, 2013.

[113] Enceladus: An active ice world in the Saturn System, Spencer, J.R., **F. Nimmo**, *Ann. Rev. Earth Planet. Sci.* 41, 693-717, 2013.

[112] Convection-driven compaction as a possible origin of Enceladus's long-wavelength topography ,^Besserer, J., **F. Nimmo**, J.H. Roberts, R.T. Pappalardo, *J. Geophys. Res.* 118, doi:10.1002/jgre.20079, 2013.

[111] The influence of imperfect accretion and radial mixing on ice:rock ratios in the Galilean satellites, [+]Dwyer, C.A., **F. Nimmo**, M. Ogihara, S. Ida, *Icarus* 225, 390-402, 2013.

[110] Flexure on Dione: Investigating subsurface structure and thermal history, Hammond, N.P., C. Phillips, **F. Nimmo**, S. Kattenhorn, *Icarus* 223 418-422, 2013.

[109] The Crust of the Moon as Seen by GRAIL, Wieczorek, M.A., G. A. Neumann, **F. Nimmo**, W. S. Kiefer, G. J. Taylor, H. J. Melosh, R. J. Phillips, S. C. Solomon, J. C. Andrews-Hanna, S. W. Asmar, A. S. Konopliv, F. G. Lemoine, D. E. Smith, M. M. Watkins, J. G. Williams, M. T. Zuber, *Science* 339 671-675, 2013.

[108] Ancient Igneous Intrusions and Early Expansion of the Moon Revealed by GRAIL Gravity Gradiometry, Andrews-Hanna, J.C., S. W. Asmar, J. W. Head III, W. S. Kiefer, A. S. Konopliv, F. G. Lemoine, I. Matsuyama, E. Mazarico, P. J. McGovern, H. J. Melosh, G. A. Neumann, **F. Nimmo**, R. J. Phillips, D. E. Smith, S. C. Solomon, G. J. Taylor, M. A. Wieczorek, J. G. Williams, M. T. Zuber, *Science* 339 675-678, 2013.

[107] Evidence for a dynamo in the main group pallasite parent body, Tarduno, J.A., R.D. Cottrell, **F. Nimmo**, J. Hopkins, J. Voronov, A. Erickson, E. Blackman, E.R.D. Scott, R. McKinley, *Science* 338 93-95, 2012.

[106] The origin and evolution of Titan, Tobie, G., J. Lunine, J. Monteux, O. Mousis, **F. Nimmo**, in *Titan: Interior, Surface, Atmosphere and Space Environment* Muller-Wodarg, Griffith, Lellouch and Cravens, eds., Cambridge Univ Press, pp. 24-50, 2012.

[105] Dissipation at tidal and seismic frequencies in a melt-free Moon, **Nimmo, F.**, U.H. Faul, E.J. Garnero, *J. Geophys. Res.* 117, E09005, 2012.

[104] Impact-driven ice loss in outer solar system satellites: Consequences for the Late Heavy Bombardment, **Nimmo, F.**, D.G. Korycansky, *Icarus* 219, 508-510, 2012.

[103] Late-stage impacts and the orbital and thermal evolution of Tethys, ^Zhang, K., **F. Nimmo**, *Icarus* 218, 348-355, 2012.

[102] A long-lived lunar dynamo driven by continuous mechanical stirring, +Dwyer, C.A., D.J. Stevenson, **F. Nimmo**, *Nature* 479 212-214, 2011.

[101] Thermal evolution of Pluto and implications for surface tectonics and a subsurface ocean, ^Robuchon, G., **F. Nimmo**, *Icarus* 216 426-439, 2011.

[100] Geophysical implications of the long-wavelength topography of the Saturnian satellites, **Nimmo, F.**, B.G. Bills, P.C. Thomas, *J. Geophys. Res.* 116 E11001, 2011.

[99] Hubble Space Telescope Advanced Camera for Surveys observations of Europa's atmospheric ultraviolet emission at eastern elongation, Saur, J., P.D. Feldman, L. Roth, **F. Nimmo**, D. Strobel, K.D. Retherford, M.A. McGrath, N. Schilling, J.-C. Gerard, D. Grodent, *Astrophys. J.* 738 153, 2011.

[98] Reorientation of Vesta: Gravity and tectonic predictions, Matsuyama, I., **F. Nimmo**, *Geophys. Res. Lett.* 38 L14205, 2011.

[97] Obliquity tides do not significantly heat Enceladus, +Chen, E.M.A., **F. Nimmo**, *Icarus* 214 779-781, 2011.

[96] Rotational dynamics and internal structure of Titan, Bills, B.G., **F. Nimmo**, *Icarus* 214 351-355, 2011.

[95] Impact basin relaxation at Iapetus, ^Robuchon, G., **F. Nimmo**, J. Roberts, M. Kirchoff, *Icarus* 214 82-90, 2011.

[94] Constraints on Martian lobate debris apron evolution and rheology from numerical modeling of ice flow,+Parsons, R.A., **F. Nimmo**, H. Miyamoto, *Icarus* 214 246-257, 2011.

[93] Evidence of a global magma ocean in Io's interior, Khurana, K.K., X. Jia, M.G. Kivelson, **F. Nimmo**, G. Schubert, C.T. Russell, *Science* 332 1186-1189, 2011.

[92] Five new and three improved mutual orbits of Transneptunian binaries, Grundy, W.M., K.S. Noll, **F. Nimmo**, H.G. Roe, M.W. Buie, S.B. Porter, S.D. Benecchi, D.C. Stephens, H.F. Levison, J.A. Stansberry, *Icarus* 213 678-692, 2011.

[91] The role of impact excavation in distributing clays over Noachian surfaces, +Barnhart, C.J., **F. Nimmo**, *J. Geophys. Res.* 116 E01009, 2011.

[90] Heterogeneous accretion, composition and core-mantle differentiation of the Earth, Rubie, D.C., D.J. Frost, U. Mann, Y. Asahara, **F. Nimmo**, K. Tsuno, P. Kegler, A. Holzheid, H. Palme, *Earth Planet. Sci. Lett.* 301 31-42, 2011.

[89] Forced obliquities and moments of inertia of Ceres and Vesta, Bills, B.G., **F. Nimmo**, *Icarus,* 213, 495-509, 2011.

[88] Structure and formation of the lunar farside highlands, Garrick-Bethell, I., **F. Nimmo**, M. Wieczorek, *Science* 330, 949-951, 2010.

[87] Geophysical implications of the long-wavelength topography of Rhea, **Nimmo, F.**, B.G. Bills, P.C. Thomas, S.W. Asmar, *J. Geophys. Res.* 115, E10008, 2010.

[86] Surface, subsurface and atmosphere exchanges on icy moons, Tobie, G., B. Giese, T.A. Hurford, R.M. Lopes, **F. Nimmo,** F. Postberg, K.D. Retherford, J. Schmidt, J.R. Spencer, T. Tokano, E.P. Turtle, *Space Sci. Rev.* 153, 375-410, 2010.

[85] Shell thickness variations and the long wavelength topography of Titan, **Nimmo, F.**, B.G. Bills, , *Icarus* 208, 896-904, 2010.

[84] Martian post-impact hydrothermal systems incorporating freezing, [+]Barnhart, C.J., **F. Nimmo**, B.J. Travis, *Icarus* 208, 101-117, 2010.

[83] Numerical modeling of Martian gully sediment transport: Testing the fluvial hypothesis, [+]Parsons, R.A., **F. Nimmo**, *J. Geophys. Res.* 115, E06001, 2010.

[82] Tungsten isotopic evolution during late-stage accretion: constraints on Earth-Moon equilibration, **Nimmo, F.**, D.P. O'Brien, T. Kleine, *Earth Planet. Sci. Lett.* 292 363-370, 2010.

[81] The role of episodic overturn in generating the surface geology and heat flow on Enceladus, O'Neill, C., **F. Nimmo**, *Nature Geosci.* 3, 88-91*,* 2010.

[80] Recent orbital evolution and the internal structures of Enceladus and Dione, ^Zhang, K., **F. Nimmo**, *Icarus* 204 597-609, 2009.

[79] Energetics of asteroid dynamos and the role of compositional convection **F. Nimmo** *Geophys. Res. Lett.* 36 L10201, 2009.

[78] Geodynamics of Europa's ice shell, **Nimmo, F.** and M. Manga, *Europa after Galileo* (Pappalardo, McKinnon, Khurana eds.), pp. 381-404, Univ. Ariz. Press, 2009.

[77] Chaotic terrain on Europa, Collins, G.C. and **F. Nimmo**, *Europa after Galileo* (Pappalardo, McKinnon, Khurana eds.), pp. 259-282, Univ. Ariz. Press, 2009.

[76] Rotational dynamics of Europa, Bills, B.G., **F. Nimmo**, O. Karatekin, T. Van Hoolst, N. Rambaux, B. Levrard, J. Laskar *Europa after Galileo* (Pappalardo, McKinnon, Khurana eds.), pp. 119-136, Univ. Ariz. Press, 2009.

[75] Enceladus: An active cryovolcanic satellite, Spencer, J.R., A.C. Barr, L.W. Esposito, P. Helfenstein, A.P. Ingersoll, R. Jaumann, C.P. McKay, **F. Nimmo**, C.C. Porco, J.H. Waite *Saturn after Cassini/Huygens,* M.K. Dougherty et al., eds, pp. 683-724, Springer 2009.

[74] Icy satellites: Geological evolution and surface processes, Jaumann, R., R.N. Clark, **F. Nimmo**, A.R. Hendrix, B.J. Buratti, T. Denk, J.M. Moore, P.M. Schenk, S.J. Ostro, R. Srama, *Saturn after Cassini/Huygens* M.K. Dougherty et al., eds, pp. 637-682, Springer 2009.

[73] Gravity and tectonic patterns of Mercury: The effect of tidal deformation, spin-orbit resonance, non-zero eccentricity, despinning and reorientation, Matsuyama, I., **F. Nimmo**, *J. Geophys. Res.* 114 E01010, 2009.

[72] The formation of Tharsis on Mars: What the line-of-sight gravity is telling us,Williams, J.-P., **F. Nimmo**, W.B. Moore, D.A. Paige, *J. Geophys. Res.* 113 , E10011, 2008.

[71] The long-term stability of a possible aqueous ammonium sulfate ocean inside Titan, Grindrod, P.M., A.D. Fortes, **F. Nimmo**, D.L. Feltham, J.P. Brodholt, L. Vocadlo, *Icarus* 197 , 137-151, 2008.

[70] A thermochemical boundary layer at the base of Earth's outer core and independent estimate of core heat flux, Gubbins, D., G. Masters, **F. Nimmo**, *Geophys. J. Int.* 174, 1007-1018, 2008.

[69] North-south asymmetry in Martian crater slopes, [+]Parsons, R.A., **F. Nimmo**, *J. Geophys. Res.* 114, E02002, 2009.

[68] Implications from Ithaca Chasma for the thermal and orbital history of Tethys, [+]Chen, E.M.A., **F. Nimmo**, *Geophys. Res. Lett.*, 35, L19203, 2008.

[67] Tectonics of the Outer Planet Satellites, Collins, G.C., W.B. McKinnon, J.M. Moore, **F. Nimmo**, R.T. Pappalardo, L.M. Prockter, P.M. Schenk, in *Planetary Tectonics*, R.A. Schultz and T.R. Watters, eds., Cambridge Univ. Press, pp. 264-350, 2010.

[66] Hf-W chronometry and the accretion and early evolution of asteroids and terrestrial planets, Kleine, T., M. Touboul, B. Bourdon, **F. Nimmo**, K. Mezger, H. Palme, Q.-Z. Yin, S.B. Jacobsen, A.N. Halliday, *Geochim. Cosmochim. Acta*, 73, 5150-5188, 2009.

[65] Tectonism on Mercury, Watters, T.R., **F. Nimmo**, in *Planetary Tectonics*, R.A. Schultz and T.R. Watters, eds., Cambridge Univ Press, pp.15-80, 2010.

[64] Implications of an impact origin for the Martian hemispheric dichotomy, **Nimmo, F.**, S.D. Hart, D.G. Korycansky, C.B. Agnor, *Nature* 453, 1220-1223, 2008.

[63] True polar wander on Europa from global-scale small-circle depressions, Schenk, P.M., I. Matsuyama, **F. Nimmo**, *Nature* 453, 368-371, 2008.

[62] Forced obliquity and moments of inertia of Titan ,Bills, B.G. and **F. Nimmo** , *Icarus* 196, 293-297, 2008.

[61] Near-surface heating on Enceladus and the south polar thermal anomaly, ^Roberts, J.H. and **F. Nimmo**, *Geophys. Res. Lett*. 35, L09201, 2008.

[60] Tectonic patterns on reoriented and despun planetary bodies, Matsuyama, I. and **F. Nimmo**, *Icarus* 195, 459-473, 2008.

[59] An experimental and numerical study of surface tension-driven melt flow, [+]Parsons, R.A., **F. Nimmo**, J.W. Hustoft, B.K. Holtzman, D.L. Kohlstedt, *Earth Planet. Sci. Lett*. 267, 548-557, 2008.

[58] Tidal heating and the long-term stability of a subsurface ocean on Enceladus, ^Roberts, J.H. and **F. Nimmo**, *Icarus* 194, 675-689, 2008.

[57] Shear heating as the origin of the plumes and heat flux on Enceladus, **Nimmo, F.**, J.R. Spencer, R.T. Pappalardo, M.E. Mullen, *Nature* 447, 289-291, 2007.

[56] Reorientation of icy satellites by impact basins, **Nimmo, F.**, I. Matsuyama, *Geophys. Res. Lett.* 34, L19203, 2007.

[55] Powering Mercury's dynamo, Williams, J.-P., O. Aharonson, **F. Nimmo**, *Geophys. Res. Lett.* 34, L21201, 2007.

[54] How rapidly did Mars accrete? Uncertainties in the Hf-W timing of core formation, **Nimmo, F.**, T. Kleine, *Icarus* 191, 497-504, 2007.

[53] The global shape of Europa: Constraints on lateral shell thickness variations, **Nimmo, F.**, P.C. Thomas, R.T. Pappalardo, W.B. Moore, *Icarus* 191, 183-192, 2007.

[52] Rotational stability of tidally deformed planetary bodies, Matsuyama, I., **F. Nimmo**, *J. Geophys. Res.* 112, E11003, 2007.

[51] Reorientation of planets with lithospheres: the effect of elastic energy, Matsuyama, I. , **F. Nimmo**, J.X. Mitrovica, *Icarus* 191, 401-412, 2007.

[50] Formation of the Earth's core, Rubie, D.C., **F. Nimmo** and H.J. Melosh, *Treatise Geophys.* v. 9, pp 51-90, G. Schubert, ed., 2007.

[49] Energetics of the core, **Nimmo, F.**, *Treatise Geophys*. v. 8, pp. 31-66, G. Schubert, ed., 2007.

[48] Thermal and compositional evolution of the core, Nimmo, F., *Treatise Geophys*. v. 9, pp. 217-242, G. Schubert, ed., 2007.

[47] The Origin of the Core, **Nimmo, F.**, in *Encyclopedia of Geomagnetism and Paleomagnetism*, D. Gubbins and E. Herrero-Bervera, eds., pp. 89-91, Springer, 2007.

[46] Properties and evolution of the Earth's core and geodynamo, **Nimmo, F.** and D. Alfe, in *Advances in Science: Earth Science*, P.R. Sammonds and J.M.T. Thompson, eds., pp. 167-210, Imperial College Press, London, 2007.

[45] Normal faulting on Europa: Implications for ice shell properties, **Nimmo, F.** and P. Schenk, *J. Struct. Geol.* 28, 2194-2203, 2006.

[44] Diapir-induced reorientation of Saturn's moon Enceladus, **Nimmo, F.** and R.T. Pappalardo, *Nature* 441, 614-616, 2006.

[43] Isotopic outcomes of N-body accretion simulations: Constraints on equilibration processes during large impacts from Hf-W observations, **Nimmo, F.** and C.B. Agnor, *Earth Planet Sci. Lett.* 243, 26-43, 2006.

[42] Europa's icy shell: Past and present state and future exploration, **Nimmo, F.**, L. Prockter, P. Schenk, *Icarus* 177, 293-296, 2005.

[41] Strain at radially-fractured centres on Venus, Grindrod, P.M., **F. Nimmo**, E.R. Stofan, J.E. Guest, *J. Geophys. Res.* 110, E12002, 2005.

[40] Thermal and topographic tests of Europa chaos formation models from Galileo E15 observations, **Nimmo, F.** and B. Giese, *Icarus* 177, 327-340, 2005.

[39] Tectonic consequences of Martian dichotomy modification by lower crustal flow and erosion, **Nimmo, F.**, *Geology* 33, 533-536, 2005.

[38] Early crustal evolution of Mars, **Nimmo, F.** and K. Tanaka, *Ann. Rev. Earth Planet. Sci.* 33, 133-161, 2005.

[37] Extensional troughs in the Caloris Basin of Mercury: Evidence of lateral crustal flow, Watters, T.R., **F. Nimmo** and M.S. Robinson, *Geology* 33, 669-672, 2005.

[36] Formation of methane on Mars by fluid-rock interactions in the crust, Lyons, J.R., C. Manning and **F. Nimmo**, *Geophys. Res. Lett.* 32, L13201, 2005.

[35] A shear heating origin for ridges on Triton, Prockter, L.M., **F. Nimmo** and R.T. Pappalardo, *Geophys. Res. Lett.* 32, L14202, 2005.

[34] Stresses generated in cooling viscoelastic ice shells, **Nimmo, F.**, *J. Geophys. Res.* 109, E12001, 2004.

[33] Furrow flexure and ancient heat flux on Ganymede, **Nimmo, F.** and R.T. Pappalardo, *Geophys. Res. Lett.* 31, L19701, 2004.

[32] Depth of faulting on Mercury: Implications for heat flux and crustal and effective elastic thickness, **Nimmo, F.** and T.R. Watters, *Geophys. Res. Lett.* 31, L02701, 2004.

[31] Thermal evolution of the Martian core: Implications for an early dynamo, Williams, J.-P. and F. Nimmo, *Geology* 32, 97-100, 2004.

[30] Non-Newtonian topographic relaxation on Europa, **Nimmo, F.**, *Icarus* 168, 205-208, 2004.

[29] Growth of the hemispheric dichotomy and the cessation of plate tectonics on Mars, Lenardic, A., **F. Nimmo** and L. Moresi, *J. Geophys. Res.* 109, E02003, 2004.

[28] The influence of potassium on core and geodynamo evolution, **Nimmo, F.**, G.D. Price, J. Brodholt, D. Gubbins, *Geophys. J. Int.* 156, 363-376, 2004.

[27] Dynamics of rifting and modes of extension on icy satellites, **Nimmo, F.**, *J. Geophys. Res.* 109, E01003, 2004.

[26] On the origins of band topography, Europa, **Nimmo, F.**, R.T. Pappalardo and B. Giese, *Icarus* 166, 21-32, 2003.

[25] Estimates of Europa's ice shell thickness from elastically supported topography, **Nimmo, F.**, B. Giese, R.T. Pappalardo, *Geophys. Res. Lett.* 30, 1233, 2003.

[24] Causes, characteristics and consequences of convective diapirism on Europa, **Nimmo, F.** and M. Manga, *Geophys. Res. Lett.* 29, 2109, 2002.

[23] Admittance estimates of mean crustal thickness and density at the Martian hemispheric dichotomy, **Nimmo, F.**, *J. Geophys. Res.* 107, 5117, 2002.

[22] Why does Venus lack a magnetic field?, **Nimmo, F.**, *Geology* 30, 987-990, 2002.

[21] Surface runoff features on Mars: Testing the carbon dioxide formation hypothesis, Stewart, S.T. and **F. Nimmo**, *J. Geophys. Res.* 107, 5069, 2002.

[20] Core values, Brodholt, J. and **F. Nimmo**, *Nature* 418, 489-491, 2002.

[19] Thermal consequences of strike-slip motion on Europa, **Nimmo, F.** and E. Gaidos, *J. Geophys. Res.* 107, 5021, 2002.

[18] Elastic thickness and heat flux estimates on Ganymede, **Nimmo, F.**, R.T. Pappalardo, B. Giese, *Geophys. Res. Lett.* 29, 1158, 2002.

[17] Constraining the crustal thickness on Mercury from viscous topographic relaxation, **Nimmo, F.**, *Geophys. Res. Lett.* 29, 1063, 2002.

[16] Strength of faults on Mars from MOLA topography, Barnett, D.N. and **F. Nimmo**, *Icarus* 157, 34-42, 2002.

[15] Flexure of Venusian lithosphere measured from residual topography and gravity, Barnett, D.N., **F. Nimmo** and D. McKenzie, *J. Geophys. Res.* 107, 5007, 2002.

[14] Constraints on the depth of magnetized crust on Mars from impact craters, **Nimmo, F.** and M.S. Gilmore, *J. Geophys. Res.* 106, 12315-12323, 2001.

[13] Estimates of Martian crustal thickness from viscous relaxation of topography, **Nimmo, F.** and D. Stevenson, *J. Geophys. Res.* 106, 5085-5098, 2001.

[12] Elastic thickness estimates for Venus using line of sight acceleration from Magellan cycle 5, Barnett, D., **F. Nimmo** and D. McKenzie, *Icarus* 146, 404-419, 2000.

[11] Tectonics and water on Europa, Gaidos, E. and **F. Nimmo**, *Nature* 405, 637, 2000.

[10] The influence of early plate tectonics on the thermal evolution and magnetic field of Mars, **Nimmo, F.** and D. Stevenson, *J. Geophys. Res.* 105, 11969-11979, 2000.

[9] Characteristics and consequences of flow in the crust, McKenzie, D., **F. Nimmo**, J. Jackson, P. Gans, E. Miller, *J. Geophys. Res.* 105, 11029-11046, 2000.

[8] Dike intrusion as a possible cause of linear Martian magnetic anomalies, **Nimmo, F.**, *Geology* 28, 391-394, 2000.

[7] The generation of Martian floods by melting permafrost above dykes, McKenzie, D. and **F. Nimmo**, *Nature* 397, 231-233, 1999.

[6] Volcanism and tectonics on Venus, **Nimmo, F.** and D. McKenzie, *Ann. Rev. Earth Planet. Sci.* 26, 23-51, 1998.

[5] Elastic thickness estimates for Venus from line of sight accelerations, McKenzie, D. and **F. Nimmo**, *Icarus* 130, 198-216, 1997.

[4] Convective thermal evolution of the upper mantles of Earth and Venus, **Nimmo, F.** and D. McKenzie, *Geophys. Res. Lett.* 24, 1539-1542, 1997.

[3] Modelling plume-related uplift, gravity and melting on Venus, **Nimmo, F.** and D. McKenzie, *Earth Planet Sci. Lett.* 145, 109-123, 1996.

[2] Comparison between the rift systems of East Africa and Beta Regio, Venus, Foster, A.N. and **F. Nimmo**, *Earth Planet. Sci. Lett.* 143, 183-196, 1996.

[1] A new occurrence of Scottish plesiosaurian remains from the island of Skye, Clark, N.D.L., **F. Nimmo** and C.J. Nicholas, *Scot. J. Geol.* 29, 197-199, 1993.