Patricio Becerra, Ph.D

Date of birth: 05.07.1985
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EDUCATION

Universität Bern, Bern, Switzerland

08.2023 – 07.2024 (expected) — **Certificate of Advanced Study,** Applied Data Science

University of Arizona, Tucson, AZ, USA

11.2011 – 08.2016 — ***Doctor of Philosophy** [**PhD**], Planetary Sciences (Minor in Geosciences)*
Thesis: "The Poles of Mars, Past and Present: A high-resolution observational study of the Martian Polar Regions and their connection to climate"

12.2012 – 12.2013 — ***Graduate Certificate** in Engineering Management*

09.2009 – 11.2011 — ***Master of Science** [**MSc**], Planetary Sciences*

Pontificia Universidad Católica del Perú, Lima, Peru

03.2002 – 12.2007 — ***Bachelor of Science** [**BSc**], Physics*

PROFESSIONAL EXPERIENCE

Micro-Cameras and Space Exploration (MCSE) SA, Neuchâtel, Switzerland

10.2021 – Present

Project Scientist:

- Oversaw end-to-end production, AIT, and delivery of miniaturized space-hard cameras.
- Led the enhancement of image processing software, interfacing with clients, and managing development for successful deployment.
- Directed radiometric and optical calibration for NASA's VIPER lunar rover's Visible Imaging System.
- Spearheaded the design and installation of an in-house laboratory for radiometric calibration of imaging sensors and camera systems.

01.2021 – 09.2021

Project Manager and Science Consultant (50%):

- Managed the design, assembly, and delivery of a calibration target and image processing toolkit for ESA's JUICE monitoring cameras.
- Recipient of "Knowledge Transfer" grant from the Swiss National Centre for Competence in Research "PlanetS".

Physikalisches Institut, Universität Bern, Bern, Switzerland

02.2017 – 09.2021

Postdoctoral Researcher in Space Research and Planetary Sciences

- Led multidisciplinary research projects in collaboration with local and international senior scientists and students
- Made and published scientifically relevant discoveries through:
  - Acquisition, manipulation and analysis of remote sensing data (images, spectra, topography, radar) of the Martian surface
  - Simulations and modelling to interpret remote sensing data
  - Design and execution of laboratory experiments: Electrical properties of soil samples to simulate the surfaces of Mars and Comets
- **Co-organized** the **7th International Conference on Mars Polar Science and Exploration** (2 weeks, 100 people). Brought conference to South America for the first time in its history.

Department of Planetary Sciences, University of Arizona, Tucson, AZ, USA

08.2016 – 01.2017 *Research Specialist*
- Pattern detection in images of the Mars north polar ice cap

09.2009 – 07.2016 *Graduate Research Associate*
- Designed, led and successfully completed a multi-year, NASA-funded PhD project focused on studying the Martian polar ice sheets
- Specialised in data processing and analysis of satellite images, hyperspectral images, and 3D products (digital elevation models)
- Created a novel data extraction method based on Fourier/Wavelet analysis and signal matching of geophysical data
- Constructed a model of spectral reflectance to simulate data from satellite cameras and spectrometers (model is still in frequent use)

National Commission for Aerospace Research and Development (CONIDA) – Peruvian Space Agency, Lima, Peru

03.2007 – 05.2009 *Research Assistant: Astronomy Department*
- Created and led a planetary astronomy research group
- Organized a week-long Short Course on Planetology for 70 people
- Successfully evaluated and reported on the sky conditions of a site selected for the construction of an observatory in Moquegua, Peru, through acquisition and processing of telescope images (Established a working relationship with agricultural communities around the observatory site, contributing to their education and development)

SPACECRAFT MISSION EXPERIENCE

Bifrost – A helicopter mission concept to the north polar cap of Mars

01.2021 – Present *Mission Concept Definition Team (5 people)*
- Definition of mission science objectives given engineering constraints and opportunities posed by a hexacopter that would land and fly on Mars

VIPER-VIS –Volatiles Investigating Polar Exploration Rover Imaging System

04.2021 – Present *MCSE Project Scientist*
- Definition of requirements and execution of procedures for the calibration of the VIPER-VIS camera sensors

Jupiter ICy Moons Explorer (JUICE) Monitoring Cameras (JMC)

03.2021 – Present *MCSE Project Manager for image processing and color*
- Led the design, assembly, integration, testing, and delivery to ESA of a color calibration target and image processing software for the JMC cameras

Colour and Stereo Surface Imaging System (CaSSIS) – Stereo camera onboard ESA ExoMars Trace Gas Orbiter

09.2017 – Present *Science Theme Deputy Lead for Ice and Periglacial Processes*
- Managed several successful data acquisition campaigns
- Selected, planned and reviewed scientifically relevant goals and data
- Tested and validated image compression algorithms

High Resolution Imaging Science Experiment (HiRISE) – Ultra high-resolution camera onboard NASA Mars Reconnaissance Orbiter

08.2016 – Present *Science Theme Lead for Climate Change*
- Prioritize image acquisition objectives related to climate change theme

2019 NASA Discovery Program Mission Proposal: Climate Orbiter for Mars Polar Atmospheric and Subsurface Science (COMPASS)

09.2018 – 02.2020 *Co-Investigator: Dual-Mode Radar (Sounder and SAR) Instrument*
- Member of a multi-national team of scientists that **designed and proposed** a mission to the NASA Discovery program (cost cap: USD 500 Million)
- Co-designed measurement objectives for the radar instrument to meet the scientific goals of the mission

NASA Planetary Science Summer School: Argus (Io flyby mission)

08.2014 *Risk and Programmatics Chair/Imaging camera Principal Investigator*

- Member of a multidisciplinary team of scientists and engineers tasked with designing a viable NASA mission proposal in two weeks
- Analysed risk and designed mitigation strategies of the mission
- Devised measurement goals and required technical specifications of the camera instrument

APPROVED GRANTS

04.2021 – 06.2021 **JUICE Monitoring Camera Simulator.** NCCR PlanetS Technology Platform. "Knowledge Transfer with a Short-Term Project"
Principal Investigator

04.2018 – 03.2020 **Investigation of the solar system using remote sensing and laboratory techniques.** Swiss National Science Foundation grant 200020_178847
Contributor

09.2016 – 08.2020 **Ice Deposits in Polar Craters on Mars.** NASA Mars Data Analysis Program grant number 80NSSC17K0510. NASA, USA
Contributor

09.2013 – 08.2016 **Wavelet Analysis of Martian Polar Stratigraphy from HiRISE Topography.** NASA Earth and Space Science Fellowship grant NNX13AO55H. NASA, USA
Principal Investigator

FELLOWSHIPS, AWARDS, HONOURS

04.2019 Geosciences Journal Travel Award

04.2019 Universität Bern Young Academics Support Award

04.2014 University of Arizona College of Science Galileo Circle Scholar

02.2014 Lunar and Planetary Institute Career Development Award

05.2013 NASA Earth and Space Science Fellowship

04.2013 Lunar and Planetary Laboratory Graduate Teaching Excellence Award

SUPERVISION OF JUNIOR RESEARCHERS

Physikalisches Institut, Universität Bern, Bern, Switzerland

09.2018 – Present *Main advisor to Adomas Valantinas. Ph.D. student.* Remote Sensing Analysis of Slope Streaks in Arabia Terra, Mars. Official supervisor: Prof. Nicolas Thomas

08.2020 – 02.2021 *Co-advisor to Lukas Affolter. M.Sc. student* (Now a Ph.D. student at the Paul Scherrer Institute/Swiss Federal Institute of Technology in Zürich). Dielectric and photometric properties of Martian simulant soils. Co-supervised with Dr. Antoine Pommerol.

Brown University, Providence, RI, USA

01.2020 – 09.2021 *Advising collaborator to Alyssa Pascuzzo. Ph.D. student.* Detangling the processes recorded in ice: Geomorphic and hyperspectral analysis of Mars' north polar spiral troughs. Principal supervisor: Prof. Jack Mustard

Georgia Institute of Technology, Atlanta, GA, USA

09.2017 – 09.2018 *Advising collaborator to Sergio Parra. B.Sc. Student* (Now a Ph.D. student at the California Institute of Technology). Surface texture of the North Polar Ice Cap of Mars. Principal supervisor: Dr. Sarah M. Milkovich (JPL)

TEACHING

	Physikalisches Institut, Universität Bern, Bern, Switzerland
09.2017 – 12.2020	*Teaching Assistant in:* Laborkurs Moderne Physik II, Physikpraktikum für Minor Physik und Pharmazie, Physik Praktikum Studierende Biologie. Instructors: Prof. Ingo Leya, Prof. Michele Weber, Prof. Saverio Braccini
	Department of Planetary Sciences, University of Arizona, Tucson, AZ, USA
09.2015 – 12.2015	*Guest lecturer* in: PTYS554 Evolution of Planetary Surfaces (Postgraduate level course).
02.2012 – 06.2013	*Teaching Assistant* in: PTYS214 Astrobiology, PTYS170B1 The Universe and Humanity.

INSTITUTIONAL RESPONSIBILITIES

	Physikalisches Institut, Universität Bern, Bern, Switzerland
02.2017 – 12.2020	Centre for Space Research & Planetary Sciences (WP), Universität Bern, Seminar Series: *Committee Member*
	Department of Planetary Sciences, University of Arizona, Tucson, AZ, USA
03.2014 – 03.2015	Lunar and Planetary Laboratory "Mission Work" Seminar Series: *Co-creator and organiser*
08.2010 – 08.2012	Lunar and Planetary Laboratory Conference: *Co-organizer*

INVOLVEMENT IN CONFERENCES AND WORKSHOPS

	7th International Conference on Mars Polar Science and Exploration, Ushuaia, Argentina
01.2020	*Co–Lead Organizer and Convener, Session Chair, Lead Synthesizer*
	Ninth International Conference on Mars, Pasadena, CA, USA
07.2019	*Session Chair*
	Keck Institute for Space Science Workshop "Unlocking the Climate Record Stored within Mars' Polar Layered Deposits I and II"
08.2017 – 11.2017	*Invited lecturer and workshop participant*
	Lunar and Planetary Science Conference, The Woodlands, TX, USA
03.2017, 03.2018	*GSA Dwornik Award judge*
03.2016	*Session chair*
	6th International Conference on Mars Polar Science and Exploration, Reykjavik, Iceland
09.2016	*Session chair*
	CONIDA First Short Course on Planetology, Lima, Peru
11.2008	*Lead organizer and convener*

SCIENTIFIC REVIEW

2017 – Present	NASA ROSES Planetary Science Research Program *Panelist and/or External Reviewer for Research and Analysis proposals to: Mars Data Analysis Program (MDAP), Cassini Data Analysis Program (CDAP), New Frontiers Data Analysis Program (NFDAP), NASA Earth and Space Science Fellowship (NESSF)*
2015 – Present	*Referee* for: Nature Astronomy, Icarus (2017 certificate for outstanding contribution), Planetary and Space Science, Science Advances, Monthly Notices of the Royal Astronomical Society, Journal of Geophysical Research – Planets
2016	NASA ROSES Planetary Science Research Program *Executive Secretary for Instrument Development proposals to Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO)*

INVITED PRESENTATIONS

02.2021	*Why fly a drone to Mars' north pole?* – Invited expert scientist presentation to NASA/JPL program managers on the best possible scientific motivation for a UAV mission to the Martian poles.
10.2020	*Radar investigations of ice bodies on Mars* – Seminar on Microwave Physics and Atmospheric Physics. Physics Institute, University of Bern.
09.2020	*Los hielos polares de Marte y su registro climático* – Coloquios de Física. Departamento Académico de Ciencias, Pontificia Universidad Católica del Perú.
01.2020	*El Hielo de Marte: Glaciología Marciana en Ushuaia* – Keynote public talk during the 7th International Conference on Mars Polar Science and Exploration, Ushuaia, Tierra del Fuego, Argentina.
03.2019	*Estudios de la superficie de Marte con el Colour and Stereo Surface Imaging System (CaSSIS) a bordo de Trace Gas Orbiter de ESA* – Curso de Geomorfología de la Patagonia Argentina, Universidad de la Patagonia Austral, Río Gallegos, Santa Cruz, Argentina.
11.2018	"Listening to Mars' Polar Climate Record" – Invited outreach presentation for Astronomy on Tap, Bern
10.2018	*Imaging of the Martian surface by the Colour and Stereo Surface Imaging System (CaSSIS) of ExoMars Trace Gas Orbiter* – Center for Space Habitability Lunch Seminar, Universität Bern
03.2018	*The Icy Polar Deposits of Mars and their Connection to Climate* – Earth and Atmospheric Sciences Seminar Series, Georgia Institute of Technology, Atlanta, GA, USA.
08.2017	*Polar Stratigraphy* – Short Course Lecture for the Keck Institute for Space Science Workshop "Unlocking the Climate Record Stored within Mars' Polar Layered Deposits I". California Institute of Technology, Pasadena, CA, USA.
11.2016	*Decifrando el Récord Climático de los Polos de Marte* – Department of Physics. Pontificia Universidad Católica del Perú. San Miguel, Lima, Perú.
12.2014	*Halos en el Polo Sur de Marte* – Comisión Nacional de Investigación y Desarrollo Aeroespacial. San Isidro, Lima, Perú.

OUTREACH AND PRESS

02.2018 – 08.2021	Management of CaSSIS social media
07.2020	SRF 10-vor-10 interview about the status and "big questions" of Mars Science
09.2019	Phys.org article "Ice islands on Mars and Pluto could reveal past climate change" on 2019 JGR paper with Michael M. Sori, et al.
07.2019	EOS Editors' Highlight and Cover Image on 2019 GRL paper: Timescales of the climate record in the south polar ice cap of Mars
06.2019	Designed the CaSSIS Mars display for the "Bern im All" event on the Bern Bundesplatz in celebration of 50 years of the Apollo 11 Moon landing
12.2018 – Present	External advisor to "The Mars Society – Chile"
05.2018	Founder of the "Planetólogos Latinos" Facebook group: A community of Latin-American planetary scientists
07.2018 – 12.2019	Astronomy on Tap – Bern: Organisation collaborator
02.2017	EOS Research Spotlight on 2017 GRL paper: Signals of astronomical climate forcing in the exposure topography of the North Polar Layered Deposits of Mars
12.2016	Interview on Radio Capital in Lima, Peru to promote the study of planetary science within the Peruvian high-school and university student community
2014, 2015	Outreach presentations on planetary science in Tucson, AZ, USA and Lima, Peru

SKILLS

Data Science
- Foundations of Machine Learning pipelines. Basic knowledge of Scikit-learn, Tensorflow
- Image and signal analysis: FFT, Wavelet analysis, Signal-matching, Monte Carlo algorithms

Remote Sensing
- Analysis of multi- and hyper-spectral imaging, sub-surface sounding radar, topography
- Geographic software: ESRI ArcGIS, IDL/ENVI Image Processing and Analysis

Geoscience
- Cyclostratigraphy, data-based interpretation of climate records, climate forcing, reflectance spectroscopy of planetary surfaces, grain size analysis, geomorphology, glaciology

Software and programming
- Project Management: MS Project, Merlin Project, Redmine PLM
- Programming: Python, IDL, Matlab; Basic knowledge of HTML and XML
- Design: Adobe Creative Cloud Tools (Photoshop, Illustrator, Acrobat)
- General: MS Windows, MS Office, macOS, Unix/Linux, LaTeX

Laboratory and Testing Experience
- Space qualification & acceptance testing: Vibration, Shock, Thermal-Vacuum, Ionising Radiation.
- Radiometric (EMVA1288) and optical (PSF, MTF) characterization of imaging systems
- Microwave measurements of dielectric properties of soil and ice samples
- Radiometric (BRDF) measurements of properties of various material samples

Field Experience
- Terrestrial Laser Scanning of vegetation bands, field measurements of snow/ice properties, participation in several field courses on geomorphology and glaciology.

CERTIFICATIONS

Project Management:
- AgilePM® Foundation and Practitioner (08.2022)
- PRINCE2® Project Management Foundation and Practitioner (11.2021)

Technical:
- European Machine Vision Association (EMVA) 1288 standard for calibrating cameras: Expert certification (01.2022)

PROFESSIONAL MEMBERSHIPS

- European Geosciences Union
- American Astronomical Society, Division of Planetary Sciences
- American Geophysical Union
- Europlanet Society
- The Planetary Society
- International Association of Cryospheric Sciences

PEER-REVIEWED PUBLICATIONS

* Research advisee or student collaborator

Landis, M.E., P.J. Acharya, N.R. Alsaeed, C. Andres, **Becerra, P.,** et al. (2023). Polar Science Results from Mars Reconnaissance Orbiter: Multiwavelength, multiyear insights. *Icarus*, https://doi.org/10.1016/j.icarus.2023.115794

Peng, J., Munaretto, G., Tornabene, L., Lucchetti, A., Cremonese G., Pajola, M., Re, C., Becerra, P., Thomas, N., (2023). Seasonal low albedo streaks at the edge of the Martian south polar layered deposits, *Icarus,* https://doi.org/10.1016/j.icarus.2023.115790

Almeida, M., M. Read, N. Thomas, G. Cremonese, **P. Becerra**, G. Borrini, M. Gruber, R. Heyd, C.M. Marriner, G. McArthur, A.S. McEwen, A. Pommerol, J. Perry, C. Schaller. Targeting and image acquisition of Martian surface features with TGO/CaSSIS, Planetary and Space Science, https://doi.org/10.1016/j.pss.2023.105697

A. Pommerol, N. Thomas , M. Almeida, M. Read, **P. Becerra**, C.Cesar, A. Valantinas, E. Simioni, A.S. McEwen, J. Perry, C. Marriner, G. Munaretto, M. Pajola, L. Tornabene, D. Mege, V. DaDeppo, C. Re, G. Cremonese. In-flight radiometric calibration of the ExoMars TGO Colour and Stereo Surface Imaging System, Planetary and Space Science, https://doi.org/10.1016/j.pss.2022.105580

Sori, M. M., **Becerra, P**., et al. (2022). Orbital forcing of Martian climate revealed in a south polar outlier ice deposit. Geophysical Research Letters, doi.org/10.1029/2021GL097450

Galofre, A.G., Serla, J.K., **Becerra, P**., Noblet, A., Conway, S.J., Patterns of martian glacial deformation: Implications for glacio-geology, internal structure, and regional climate, Planetary and Space Science (2022), https://doi.org/10.1016/j.pss.2022.105548

Lethuillier, A., E. Kaufmann, C. Feller, **P. Becerra**, A. Pommerol, N. Hännidd, D. Haack, D. Rebecca, B. Gundlach, J. Blum, G. Kargl, J. Knollenberg, N. S. Molinski, T. Gilke, H. Sierks, P. Tiefenbacher, H. Capelo, C. Güttler, K. Otto, D. Bischoff, M. Schweighart. Cometary dust analogue for physics experiments, *Mon. Not. R. Astron. Soc.,* 515, 3, 3420–38, https://doi.org/10.1093/mnras/stac1734

Munaretto, G., M. Pajola, A. Lucchetti, G. Cremonese, E. Simioni, C. Re, S. Bertoli, L. Tornabene, A. McEwen, **P. Becerra**, V.G. Rangarajan, A. Valantinas, A. Pommerol, N. Thomas, G. Portyankina (2022) Multiband photometry of Martian Recurring Slope Lineae (RSL) and dust-removed features at Horowitz crater, Mars from TGO/CaSSIS color observations, *Planetary and Space Science,* 214, 105443, https://doi.org/10.1016/j.pss.2022.105443

Sori, M.M., **P. Becerra**, J. Bapst, S. Byrne, R. McGlasson (2022). Orbital forcing of Martian climate revealed in an outlier ice deposit, *Geophysical Research Letters,* https://doi.org/10.1029/2021GL097450

*Valantinas, A., **P. Becerra**, A. Pommerol, L.L. Tornabene, L. Affolter, G. Cremonese, E. Hauber, A.S. McEwen, G. Munaretto, M. Pajola, A. Parkes Bowen, M.R. Patel, V.G. Rangarajan, N. Schorghofer, N. Thomas (2022) Multi-Angular Observations of Martian Slope Streaks, *Planetary and Space Science*, 209, 105373, https://doi.org/10.1016/j.pss.2021.105373

Becerra, P., I.B. Smith, C. Andres, A.M. Bramson, P. Buhler, A. Coronato, S. Diniega, J.A. Emmett, A. Grau Galofre, C. Herny, S. Hibbard, M.A. Kahre, J.P. Knightly, S. Nerozzi, G. Portyankina, J. Rabassa, L. Tamppari, T. Titus, J.L. Whitten, Z. Yoldi (2021), Past, Present and Future of Mars Polar Science: Outcomes and Outlook from the 7th International Conference on Mars Polar Science and Exploration, *The Planetary Science Journal,* 2:209*,* https://doi.org/10.3847/PSJ/ac19a5

Dundas, C.M., **P. Becerra**, S. Byrne, M. Chojnacki, I. J. Daubar, S. Diniega, C.J. Hansen, K.E. Herkenhoff, M. Landis, A.S. McEwen, G. Portyankina, *A. Valantinas (2021) Active Mars: A Dynamic World, *J. of Geophys. Res.: Planets,* https://doi.org/10.1029/2021JE006876

Thomas, N., **P. Becerra**, I.B. Smith, (2021) Mars and the ESA Science Programme: The case for Mars Polar Science, *Experimental Astronomy,* https://doi.org/10.1007/s10686-021-09760-6

G. Munaretto, M. Pajola, G. Cremonese, C. Re, A. Lucchetti, E. Simioni, A. S. McEwen, A. Pommerol, **P. Becerra**, S. J. Conway, N. Thomas, M. Massironi (2020), First CaSSIS observations of Martian Recurring Slope Lineae: implications for their origin and evolution, *Planetary and Space Science* 187, https://doi.org/10.1016/j.pss.2020.104947

Smith, I.B., P.O. Hayne, S. Byrne, **P. Becerra**, M. Kahre, W. Calvin, C.S. Hvidberg, S. Milkovich, P. Buhler, M. Landis, B. Horgan, A. Kleinbohl, M. Perry, R. Obbard, J. Stern, S. Piqueux, N. Thomas, K. Zacny, L. Carter, L. Edgar, J. Emmett, T. Navarro, J. Hanley, M. Koutnik, N. Putzig, B. Henderson, J.W. Holt, B. Ehlmann, S. Parra, D. Lalich, C. Hansen, M. Hecht, D. Banfield, K. Herkenhoff, D.A. Paige, M. Skidmore, R.L. Staehle, M. Siegler (2020) The Holy Grail: A Strategy for Unlocking the Climate Record Stored within Mars' Polar Layered Deposits, *Planetary and Space Science*, 184, https://doi.org/10.1016/j.pss.2020.104841.

Sori, M.M., J. Bapst, **P. Becerra**, and S. Byrne (2019), Islands of ice on Mars and Pluto, *J. of Geophys. Res.:Planets*, 124. https://doi.org/10.1029/2018JE005861. Cover of the issue.

Becerra, P., Sori, M. M., Thomas, N., Pommerol, A., Simioni, E., Sutton, S. S., Tulyakov, S., Cremonese, G. (2019). Timescales of the climate record in the south polar ice cap of Mars. *Geophys. Res. Lett.* 46, 7268–7277. https://doi.org/10.1029/2019GL083588. AGU Eos Editors' Highlight (<2% of papers are highlighted) and cover of the issue.

Brouet, Y., **Becerra, P.**, Sabouroux, P., Pommerol, A., Thomas, N., (2018), A Laboratory-based Dielectric Model for the Radar Sounding of the Martian Subsurface, *Icarus* 321: 960-973, https://doi.org/10.1016/j.icarus.2018.12.029.

Brouet, Y., Cerubini, R., Pommerol, A., Thomas, N., Neves, L., Sabouroux, **P., Becerra**, P., Grima, C., (2018) Dielectric spectroscopy measurements of saline aqueous solutions in the VHF-UHF bands: towards a dielectric model for icy satellites' water reservoirs. *Proceedings of the 5th IEEE International Workshop on Metrology for Aerospace.* https://doi.org/10.1109/MetroAeroSpace.2018.8453527

Smith, I.B., S. Diniega, D.W. Beaty, T. Thorsteinsson, **P. Becerra**, A. M. Bramson, S.M. Clifford, C.S. Hvidberg, G. Portyankina, S. Piqueux, A. Spiga and T.N. Titus (2018), 6th international conference on Mars polar

science and exploration: Conference summary and five top questions, *Icarus* 308: 2-14, https://doi.org/10.1016/j.icarus.2017.06.027

Tornabene, L.L, F. P. Seelos, A. Pommerol, N. Thomas, C.M. Caudill, **P. Becerra**, J.C. Bridges, S. Byrne, M. Cardinale, M. Chojnacki, S.J. Conway, G. Cremonese, C.M. Dundas, M.R. El-Maarry, C.J. Hansen, K. Hansen, T.N. Harrison, R. Henson, L. Marinangeli, A.S. McEwen, M. Pajola, S.S. Sutton, J.J. Wray (2018), Simulation and assessment of the colour and spatial capabilities of the Colour and Stereo Surface Imaging System (CaSSIS) on the ExoMars Trace Gas Orbiter, *Space Sci. Rev.* 214: 18. https://doi.org/10.1007/s11214-017-0436-7.

Becerra, P., M. M. Sori, and S. Byrne (2017), Signals of astronomical climate forcing in the exposure topography of the North Polar Layered Deposits of Mars, *Geophys. Res. Lett.,* 44, 62–70, https://doi.org/10.1002/2016GL071197. AGU Eos Research Spotlight.

Becerra, P., S. Byrne, M. M. Sori, S. Sutton, and K. E. Herkenhoff (2016), Stratigraphy of the north polar layered deposits of Mars from high-resolution topography, *J. Geophys. Res. Planets*, 121, 1445–1471, https://doi.org/10.1002/2015JE004992.

Brown, A. J., Calvin, W.M., **Becerra, P.**, Byrne, S. (2016), Martian north polar cap summer water cycle, *Icarus*, 277, 401 - 415, doi:10.1016/j.icarus.2016.05.007.

Thompson, M.S., Zega, T.J., **Becerra, P.**, Keane, J.T., Byrne, S. (2016). The Oxidation State of Nanophase Fe Particles in Lunar Soil: Implications for Space Weathering. *Meteoritics and Planetary Science* 51, 6: 1082–1095. https://doi.org/10.1111/maps.12646.

Becerra, P., Byrne, S., Brown A. J. (2015). Transient Bright "halos" on the South Polar Residual Cap of Mars: Implications for mass balance. *Icarus* 251: 211-225. doi: 10.1016/j.icarus.2014.04.050.

Pelletier, J. D., DeLong, S. B., Orem, C. A., **Becerra, P.**, Compton, K., Gressett, K., Lyons-Baral, J., McGuire, L. A., Molaro, J. L., and Spinler J. C. (2012). How do vegetation bands form in dry lands? Insights from numerical modelling and field studies in southern Nevada, USA. *J. Geophys. Res.*, 117, F04026, https://doi.org/10.1029/2012JF002465.

French, R.S., Showalter, M. R., Sfair, R., Argüelles, C., Pajuelo, M., **Becerra, P.**, Hedman, M. M., Nicholson, P. D. (2012). The Brightening of Saturn's F Ring. *Icarus* 219: 181-193. https://doi.org/10.1016/j.icarus.2012.02.020

NON-REFEREED PUBLICATIONS

Becerra, P., I.B. Smith, A. Coronato, J. Rabassa (2020). Mars Polar Science at the End of the World. *Nature Astronomy* (Meeting Report). https://doi.org/10.1038/s41550-020-1127-y

Becerra, P., A.M. Bramson, A.J. Brown, et al. (2020) The Importance of the Climate Record in the Martian Polar Layered Deposits, White Paper #144 submitted to the Planetary Science and Astrobiology Decadal Survey 2023–2032, *Bulletin of the AAS*, Vol. 53, Issue 4, https://doi.org/10.3847/25c2cfeb.90c37f59

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LANGUAGES

Spanish-English fully bilingual, Italian (B2/C1 – Advanced intermediate), German (A2/B1 – Beginner intermediate), French (A1 – Beginner)

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