

Dr. A.J. Purdy

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Research & Professional Experience

Sr. Research Scientist, California State University at Monterey Bay Department of Applied Environmental Science	2012-Present
Assistant Professor, University of San Francisco Department of Environmental Science Geospatial Analysis Lab	2019-2022
Post-Doctoral Scholar, NASA Jet Propulsion Laboratory Caltech Carbon and Ecosystems Group, Advisor: Joshua Fisher	2018-2019

Education

Ph.D., University of California, Irvine Earth System Science, Advisor: James Famiglietti	2018
Master in Science University of California, Irvine Earth System Science, Advisor: James Famiglietti	2014
Master in Science California State University of Monterey Bay Coastal Watershed Science and Policy, Advisors: Fred Watson & Forrest Melton	2012
Bachelor of Arts & Bachelor of Science University of San Diego Industrial and Systems Engineering	2008

Publications

- In review* Liu, P.W., Famiglietti, J.S., **Purdy, A.J.**, et al., Groundwater Depletion in California's Central Valley Accelerates During Megadrought Submitted to Nature Communications
- In prep* Felton, A., ... **Purdy, A.J.** et al., Global estimates of the storage and transit time of water through vegetation.
- 2020 Fisher, J.B., Lee, B., **Purdy, A.J.**, Halverson, G. et. al., ECOSTRESS: NASA's next generation mission to measure evapotranspiration from the International Space Station Water Res. Res. <https://doi.org/10.1029/2019WR026058>
- 2020 Wu, G., Cai, X., Keenan, T.F., Li, S., Lou, X., Fisher, J.B., Cao, R., Li, F., **Purdy, A.J.**, Zhao, W., Sun, X., Hu, Z. Evaluating three evapotranspiration estimates from model of different complexity over China using the ILAMB benchmarking system Journal of Hydrology 590:125553 <https://doi.org/10.1016/j.jhydrol.2020.125553>
- 2020 Sadeghi, M., Ebtehaj, A., Crow, W.T., Gao, L., **Purdy, A.J.**, Fisher, J.B., Jones, S.B., Tuller, M. (2020) Global Estimates of Land Surface Net Water Flux from SMOS and SMAP Satellite Soil Moisture Data Journal of Hydrometeorology. <https://doi.org/10.1175/JHM-D-19-0150.1>
- 2019 **Purdy, A.J.**, David, C.H., Sikder, M.S., Reager, J.T., Chandanpukar, H.A., Jones, N.L., Matin, M.A., An Open-Source Tool to Facilitate the Processing of GRACE Observations and GLDAS Outputs: An Evaluation in Bangladesh. Front. Environ. Sci., 23. <https://doi.org/10.3389/fenvs.2019.00155>
- 2019 **Purdy, A.J.**, Kawata, J., Fisher, J.B., Reynolds, M., Om, G., et. al., Designing drought indicators. Bulletin of the American Meteorological Society <https://doi.org/10.1175/BAMS-D-18-0146.1>
- 2019 Massoud, E.C., Purdy, A.J., Christoffersen, B. O.; Santiago, L. S.; Xu, C. , Bayesian inference of hydraulic properties in and around a white fir using a process-based ecohydrologic model. Environmental Modelling & Software. <https://doi.org/10.1016/j.envsoft.2019.01.022>
- 2018 **Purdy, A.J.**, Fisher, J.B., Goulden, M.L., Colliander, A., Halverson, G., Tu, K., Famiglietti, J.S., *SMAP soil moisture improves global evapotranspiration*. Remote Sensing of Environment 219: 1-14 <https://doi.org/10.1016/j.rse.2018.09.023>
- 2018 Talsma, C.J., Good, S.P., Miralles, D.G., Fisher, J.B., Martens, B., Jiménez, C., **Purdy, A.J.**, Sensitivity of Evapotranspiration Components in Remote Sensing-Based Models. Remote Sens. 10, 1601; <https://doi.org/10.3390/RS10101601>

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- 2018 Massoud, E.C., **Purdy, A.J.**, Miro, M., Famiglietti, J.S. *Projecting groundwater storage changes in California's Central Valley*. Scientific Reports 8 (1), 12917
<https://doi.org/10.1038/S41598-018-31210-1>
- 2018 Talsma, C., Good, S.P., Jimenez, C., Martens, B., Fisher, J.B., Miralles, D., McCabe, M., **Purdy, A.J.** *Partitioning of Evapotranspiration in Remote Sensing-based Models*. Agricultural and Forest Meteorology 260, 131:143. <https://doi.org/10.1016/J.AGRFORMET.2018.05.010>
- 2017 Joshua B. Fisher, Elizabeth Middleton, Forrest Melton, Martha Anderson, Simon Hook, Christopher Hain, Richard Allen, Matthew McCabe, Jean-Pierre Lagouarde, Kevin Tu, Dennis Baldocchi, Philip A. Townsend, Ayse Kilic, Johan Perret, Diego Miralles, Duane Waliser, **A.J. Purdy**, Andrew French, David Schimel, James S. Famiglietti, Graeme Stephens, Eric F. Wood, *The Future of Evapotranspiration: Global requirements for ecosystem functioning, carbon and climate feedbacks, agricultural management, and water resources*. Water Resour. Res., 53, 2618–2626,
<https://doi.org/10.1002/2016WR020175>
- 2016 **Purdy, A.J.**, Fisher, J.B., Goulden, M., Famiglietti, J.S., (2016), *Ground heat flux: An analytical review of 6 models evaluated at 88 sites and globally*. JGR Biogeosciences.
<https://doi.org/10.1002/2016JG003591>
- 2016 Castle, S., Thomas, B., Reager, J.T., **Purdy, A.J.**, Lo, M., Famiglietti, J.S., (2016), *Remote detection of water management impacts on evapotranspiration in the Colorado River Basin*. Geophysical Research Letters. <https://doi.org/10.1002/2016GL068675>
- 2011 Melton, F.S., Johnson, L.F., Lund, C.P., Pierce, L.L., Michaelis, A.R., Hiatt, S.H., Guzman, A., Adhikari, D.D., **Purdy, A.J.**, Rosevelt, C., Votava, P., Trout, T.J., Temesgen, B., Frame, K., Sheffner, E.J., Nemani, R.R., (2011), *Satellite irrigation management support with the terrestrial observation and prediction system: a framework for integration of satellite and surface observations to support improvements in agricultural water resource management*. IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing 5(6): 1709-1721
<https://doi.org/10.1109/JSTARS.2012.2214474>

Conference Presentations

- 2021 Felton, A ... **Purdy, A.J.**, et al., Global estimates of the storage and transit time of water through vegetation *AGU Fall 2021*
- 2021 Halverson, G., ... **Purdy, A.J.**, et al., Improvements to ECOSTRESS Algorithms and Products in Collection 2 *AGU Fall 2021*
- 2019 Khanna, M., Halverson, G., **Purdy, A.J.**, et al., An overview of NASA JPL's remotely sensed evapotranspiration data *Poster Presentation AGU Fall 2019*
- 2019 Fisher, J.B., Lee, B., **Purdy, A.J.** et al., First evapotranspiration results from NASA's ECOSTRESS mission *Oral Presentation AGU Fall 2019*
- 2018 **Purdy, A.J.**, Fisher, J., Kawata, J., Reynolds, M., Om, G. Sikka, M., Designing Drought indicators. *Oral Presentation AGU Fall 2018*
- 2018 Famiglietti, J.S., Liu, P., McEvoy, A., Wiese, D.N., Reager, J.T., **Purdy, A.J.**, Rodell, M., David, C.H., Food Grows where Groundwater Flows: California Grapples with Chronic Water Scarcity. *Oral Presentation AGU Fall 2018*
- 2017 **Purdy, A.J.**, Fisher, J., Goulden, M.L., Randerson, J.S., Famiglietti, J.S., Water vs. Carbon: An evaluation of SMAP soil moisture, evapotranspiration, & OCO-2 solar induced fluorescence to characterize global plant stress. *Poster Presentation AGU Fall 2017*
- 2016 **Purdy, A.J.**, Fisher, J., Famiglietti, J.S., Potential for SMAP soil moisture observations to improve remote sensing of evapotranspiration algorithms. *Oral Presentation AGU Fall 2016*

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- 2015 **Purdy, A.J.**, Fisher, J., Famiglietti, J.S., Ground Heat Flux: What's the best approach. *Oral Presentation AGU Fall 2015*
- 2014 Castle, S., Reager, J.T., Thomas, B.F., **Purdy, A.J.**, Lo, M. H., Rodell, M., Famiglietti, J.S., Assessing the impacts of water management on evapotranspiration in the Colorado River Basin. H34D-06 *AGU Fall 2014*
- 2013 **Purdy, A.J.**, Famiglietti, J.S. Remote sensing and modeling evapotranspiration: A high-resolution multi-method comparison at point and basin scales in California. *Oral Presentation AGU Fall 2013*
- 2013 Crop Specific Drainage and NO₃ Leaching in California's Central and Salinas Valleys: Monitoring and Management. K. Post, C. Lund, **A. Purdy** and I. Harlan, L. Pierce, L. Johnson and F. Melton. The U.S. Society for Irrigation and Drainage Professionals Conference, Sacramento California.
- 2012 Melton, F.S. Lund, C., Johnson, L., Michaelis, A., Pierce, L., Guzman, A., Hiat, S., **Purdy, A.**, Rosevelt, C., Brandt, W., Votava, P., Nemani, R., Satellite Mapping of Agricultural Water Requirements in California with the Terrestrial Observation and Prediction System. H21H-1272 *AGU Fall 2012*
- 2011 **Purdy, A.J.**, Lund, C.P., Pierce, L., Melton, F.S., Guzman, A., Harlan, I., Holloway, R., Johnson, L., Lee, C., Nemani, R. Applications of wireless sensor networks, soil water balance modeling, and satellite data for crop evapotranspiration monitoring and irrigation management support. H21F-120: *Poster AGU Fall 2011*
- 2011 Melton, F., Johnson, L., Lund, C., Michaelis, A., Pierce, L., Guzman, A., Hiat, S., **Purdy, A.J.**, Lee, C., Rosevelt, C., Fletcher, N., Votava, P., Milesi, C., Hashimoto, H., Wang, W., Scheffner, E.J., Nemani, R., Satellite Monitoring and Management Support in California with the Terrestrial Observation and Prediction System H21F-1227 *AGU Fall 2011*

Book Chapters

Cloud-based Remote Sensing with Google Earth Engine: Fundamentals & Applications. Cardille, Clinton, Crowley, and Saah (Eds). Anticipated Publication August 2022

- Lead Author: *Chapter F5.0: Exploring Vectors*
- Lead Author: *Chapter A2.1: Groundwater Monitoring with GRACE*

White Papers

- 2011 Pugh, K., Arenas, R., Cubanski, P., Lancot, M., **Purdy, A.J.**, Bassett, R., Smith, J., Hession, S., Stoner, K., Ashbach, R., Alberola, G., Jacuzzi, N., Watson, F., Stormwater outfall watershed delineation, land cover characteristics, and recommended priorities for monitoring and mitigation in the City of Pacific Grove, California The Watershed Institute Publication No. WI-2011-02
- 2011 Stoner, K., Smith, D., Cubanski, P., Pugh, K., Jacuzzi, N., Arenas, A., **Purdy, A.J.**, Bassett, R., Smith, J., Hession, S., Assessment of a photometric analysis technique for monitoring beach nourishment: An example from Del Monte Beach, Monterey, California The Watershed Institute Publication No. WI-2011-05

Field Experience

- 2020-present Star Route Farms: Measuring water cycling at one of the longest operating organic farms in California. Equipment installed on the farm measures changes in water storage, infiltration, and irrigation. Collaborating with farm management, I am working to translate soil moisture observations towards useful information to support active management and optimization of water resources.
- 2016 FLUXCOURSE: Boulder, CO. Two-week workshop focused Eddy Covariance observations,

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- including the theory, measurement, and modeling of canopy scale gas and energy exchange.
- 2015 SMAP-Ex 5 2015: Soil Moisture Active Passive Calibration & Validation. Murrumbidgee River, Australia. Supported on-ground soil moisture measurements, instrument calibration, and vegetation water content sampling.
- 2010-2012 TOP-SIMS: Satellite irrigation management support project. Central Valley and Salinas Valley, California. Installed and maintained wireless meteorological and soil moisture sensor networks to calculate field scale water budgets. Installed surface renewal flux towers to measure Latent Heat in agricultural fields. Processed soil moisture data. Attended meetings with agricultural growers and field managers to communicate how potential evapotranspiration and soil moisture data can assist irrigation management.

Student Mentorship

- 2021-2022 Jesse Carlson (USF): Measuring water cycling at Star Route Farms. Accepted into Summer 2022 NASA DEVELOP Internship Program
- 2020 Ashwini Badgajar (USF): Applying machine learning to map fire progression. Accepted into Fall 2020 NASA DEVELOP Internship Program.
- 2020-2021 Raphael Louis (USF): Development of a Google Earth Engine Application to support the Sustainable Groundwater Management Act
- 2019-2020 Nina Trusso (USF): Mapping seasonal wetlands in Coyote Creek, California. Awarded best graduating student Master's Project.
- 2019-2020 Brian Lee (JPL): Developing a robust method to validate satellite-derived evapotranspiration measurements from globally distributed eddy covariance towers.

Teaching Experience

University of San Francisco Geospatial Analysis Lab

- Introduction to Google Earth Engine (2 units F2021)
- Mapping Sustainable Energy (1 unit S2021)
- Remote Sensing with GIS (2 units S2020, S2021)
- GIS & Watershed Systems (2 units F2020, S2022)
- GIS 1: Introduction to Geospatial Technology & GIS (4 units F2019, F2020, F2021)
- GIS 2: Intermediate GIS & geospatial programming (4 units S2020, S2021, S2022)
- Accelerated Introduction to GIS, USF (2 units F2019, S2020, F2020, F2021)
- Accelerated Intermediate GIS, USF (2 units S2021)

Prior to University of San Francisco

- International Center for Integrated Mountain Development (ICIMOD) (Kathmandu, Nepal), Training of Trainers: Estimation of Groundwater Storage Changes Using GRACE Satellites, 22-24 April 2019.
- CUAHSI: Instructor, Workshop on NASA remote sensing and hydrology. Tucson, AZ Boston, MA (2016-2017)
- Terrestrial Hydrology: Teaching Assistant UCI (2016)
- Data Analysis: Teaching Assistant UCI (2015)
- On Thin Ice: An introduction to cryosphere science: Teaching Assistant UCI (2014)
- Local and Regional Environmental Issues: Teaching Assistant UCI (2014)
- Fundamental Processes in Earth and Environmental Studies: Teaching Assistant UCI (2013)
- Physics II: Lab Instructor and Tutor CSUMB (2010-2011)
- Physics I: Teaching Assistant and Tutor CSUMB (2010-2011)

Grants, Funding, & Awards

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2022	ECOSTRESS Validation Phase II: NASA JPL subcontract to update ECOSTRESS validation and provide feedback on ancillary variables 50K/6 months
2020-2022	USF Faculty Award, <i>Measuring Water Cycling at Star Route Farms</i> . Supporting farm operations optimize water use efficiency through irrigation managements 15K
2016-2019	NASA Science Utilization of the Soil Moisture Active Passive Mission (SUSMAP) (2016-2019) <i>SMAP soil moisture to improve remotely sensed estimates of evapotranspiration</i> 600K/3-yr. Co-I as a graduate student.
2016-2018	NASA Earth System Science Fellowship: <i>Water vs Carbon: An evaluation of SMAP soil moisture and OCO-2 Fluorescence to characterize global plant stress</i> . 135 K/3yr
2015	NASA summer grant to evaluate SMAP soil moisture to support evapotranspiration 25K
2014	University of California, Irvine Public Impact Honorable Mention Fellow
2014	Earth System Science Graduate Student Representative
2008	Tau Beta Pi, Engineering Honor Society
2007	Industrial and Systems Engineering Academic Excellence Award, University of San Diego
2007	Research Experience for Undergraduates: Manufacturing Engineering Texas A&M University College Station, TX

Technical Skills

Programming & Software Python, JavaScript, ESRI ArcPro, Matlab, R, NCO, HEC-HMS, HEC-RAS

Professional Service

Journal Reviewer

Geophysical Research Letters, Bulletin of the American Meteorological Society, Remote Sensing of Environment, Remote Sensing, Water Resources Research, Journal of Hydrometeorology, Agricultural and Forest Meteorology, Journal of Geophysical Research-Atmospheres, Geoscientific Model Development, Water, Applied Water Science, Irrigation Science

Peer reviews for funding agencies

Invited Panelist to Review National Aeronautics and Space Administration Proposals (2x)

GitHub repositories & Data Sharing

[SHBAAM](#): GRACE Groundwater data processing using Satellite Hydrology Bits Analysis And Mapping *Command Line Code* | Developed as part of **Purdy, A.J.** et al., 2020. An Open-Source Tool to Facilitate the Processing of GRACE Observations and GLDAS Outputs: An Evaluation in Bangladesh

[PT-JPL](#) Model *Python Code* | See Fisher et al., 2008 Global estimates of the land-atmosphere water flux based on monthly AVHRR and ISLSCP-II data, validated at 16 FLUXNET sites. Developed for use in Talsma et al., 2018a,b

[Robust Ecosystem Water and Energy Fluxes](#) *Python Code* | Developed for Fisher, J.B., Lee, B., **Purdy, A.J.**, et al. 2020 ECOSTRESS: NASA's Next Generation Mission to Measure Evapotranspiration From the International Space Station. for details on eddy covariance flux estimates.

See my personal website for available data: www.ajpurdy.com

Prior Professional Experience

Loss Prevention Consultant, Golden Eagle Insurance (now Liberty Mutual) 2008-2010

Analyzed hazards, exposures, and controls for different businesses insured by Golden Eagle Insurance. I interfaced with clients, evaluated exposures and controls, and completed internal reports for underwriting policies. Provided risk mitigation services to larger accounts.