JCET Cooperative Agreement NNX15AT34A

Year 2 Quarterly Report # 2

PERIOD COVERED: JANUARY 1 – MARCH 31, 2017

Dear GSFC Colleagues,

The new JCET cooperative agreement has completed the second quarter of its second year. We are delighted to report that the JCET Executive Board met for the first time in this Cooperative Agreement during this quarter. This report describes the research of the JCET faculty, funding proposals that have been submitted the second quarter of year two, as well as education and outreach efforts of the Center, changes in personnel and upcoming events.

With great pleasure, we submit this quarterly report highlighting our ongoing partnership with NASA Goddard Space Flight Center.

Sincerely,

Belay B. Demoz, **JCET Director**, and the JCET team.

Joint Center for Earth Systems Technology, 5523 Research Park DR, #320, Baltimore, MD 21250

HIGHLIGHTS : *A SUMMARY OF NEWSWORTHY JCET ACTIVITY.*

AWARDS

None this quarter.

NOTEWORTHY

JCET Executive Board Meeting

The JCET Executive Board Meeting was held at UMBC on March 7, 2017. The meeting, organized by JCET director Belay Demoz, included supervisory representatives from key organizations in GSFC 610: Christa Peters-Lidard (610HBG), Torry Johnson (610HBG), Steve Platnick (610AT), Lazaros Oreopoulos (613), Jim Gleason (614), Carolos Del Castillo (616), and Ali Tokay (612/UMBC). UMBC representatives included Karl Steiner (Vice President for Research) and the chairs of departments that have affiliated JCET faculty. There had been a hiatus in meetings of the JCET Executive Board resulting from the change in leadership of the center. JCET, UMBC and Goddard management have agreed to get the schedule back on an annual track henceforth.

97th AMS Annual Meeting | 22–26 January 2017 | Seattle, WA

Ali Tokay (612/UMBC) presented a paper titled "vertical variability of the raindrop size distribution" during the 31st Conference on Hydrology.

Kevin Vermeesch (612/UMBC) gave a presentation entitled "Demonstration of a ceilometer lidar network in PECAN and potential applications to ASOS" in the Eighth Symposium on Lidar Atmospheric Applications. The talk summarized a project working with the National Weather Service to obtain aerosol backscatter profiles from ASOS ceilometers, its potential uses, progress to date, and further work needed.

Kerry Meyer (613), Steven Platnick (610), **Zhibo Zhang** (610/UMBC), gave an invited talk entitled “An imager remote sensing technique for simultaneous retrievals of above-cloud absorbing aerosols and underlying boundary layer stratocumulus clouds” at the 9th Symposium on Aerosol-Cloud-Climate Interactions.

Climate & Radiation Laboratory Seminars

January 4, **Frank Werner** (UMBC), presented “Quantifying the impact of subpixel reflectance variability on cloud property retrievals using high-resolution ASTER observations.”

January 18, **Stephen Nicholls** (612/UMBC), “Out of this world: An evaluation of infrared and microwave sounding data for characterizing the dynamics and evolution of the Saharan Air Layer in North Africa.”

February 1, **Jae Lee** (613/UMBC) , presented “The Role of the Sun in Climate.”

More Highlights

Lorraine Remer (613/UMBC) attended the PACE Science Team Meeting, Harbor Branch Oceanographic Institute, Florida, January 17-19.

Valerie Casasanto (610/UMBC) discussed ICESat-2with a group of approximately 60 high school students from Frederick County during a visit through Goddard's Office of Education on January 17. Students viewed the ICESat-2 altimeter exhibit and the "Photon Jump" animation.

During Code 600's Annual Sciences & Exploration Directorate New Year's Poster Party on January 18, **Valerie Casasanto** (610/UMBC) led participants through the ICESat-2 altimeter exhibit to get their heights measured. Valerie also presented a poster on ICESat- 2 citizen science.

Ana Prados (614/UMBC) participated in the National Council for Science and the Environment's 17th National Conference and Global Forum on Science, Policy and the Environment: Integrating Environment and Health, Jan 24-26. She co-organized a session (with Shobhana Gupta and Barry Lefer, NASA HQ) entitled "Health Applications of NASA Remote Sensing", and also provided a talk for that session entitled "Air Quality Applications of NASA Remote Sensing". In addition, Prados presented a poster and two NASA Hyperwall talks on NASA's Applied Remote Sensing Training Program (ARSET).

Catherine Kruchten (160/UMBC) provided professional development on the NASA's BEST (Beginning, Engineering Science and Technology) curriculum to 29 formal and informal educators at the Intrepid Sea, Air and Space Museum on Saturday, February 11.

Jae Lee (613/UMBC) participated in a 2-day workshop at the cryogenic radiometer facility at the University of Colorado, Boulder, February 22-23. The facility provides accurate radiometric calibration for total and spectral irradiance measurements with an accuracy better than 300 and 2000 ppm, respectively. It is a key ground-based reference to calibrate and evaluate TSIS-1 TIM (total irradiance monitor) and SIM (spectral irradiance monitor) instrument performance, and transfer the NIST-traceable calibration to space- borne solar irradiance measurements.

Ali Tokay (612/UMBC) gave a talk at the GPM Olympic Peninsula Experiment (OLYMPEX) Data Workshop, which was held March 21-23, 2017, in Seattle, WA. The workshop focused on coordinating OLYMPEX dataset quality control and science analysis.

Valerie Casasanto (610/UMBC) met with the exhibit staff at the Port Discovery Children's Museum in Baltimore to help organize a "STEM in Spring Event," to be held on Saturday, April 15. The ICESat-2 Outreach Team will play a vital role in the event. ICESat-2 outreach will highlight the mission through hands-on activities, exhibits, and new and exciting visuals.

NEW TASKS:

Task 155
Sponsor: Thomas Hanisco (614)
JCET personnel: Reem Hannun, Post Doc

NASA has selected a new airborne mission to measure light from the Moon more accurately than ever before, to facilitate its use as a high-accuracy absolute radiometric reference for Earth observing satellite instruments. Having such a reference is particularly important to accurately observe global changes in biological processes in the Earth's oceans, which produce food, take up carbon dioxide, and yield half the oxygen that we breathe. The new mission, called air-LUSI (airborne LUnar Spectral Irradiance), will fly on the NASA ER-2 aircraft, formerly the American U-2 spy plane now recommissioned to support NASA research. At an altitude of 20 km (65,000 ft), the air-LUSI instrument system will observe the Moon above 90% of the atmosphere, which is much closer to the air-free view that orbiting satellites have of the Moon. The effort is being led by Kevin Turpie (616/UMBC). The measuring system will be developed, calibrated, and operated by Steven Brown and John Woodward of the U.S. National Institute of Standards and Technology (NIST). Dr. Andrew Gadsden, of the University of Guelph, is developing a critical part of the air-LUSI instrument system that keeps the instrument pointing at the Moon, compensating for the movement of Moon and the aircraft. Engineering, integration and aeronautic tasks will be carried out with help from Hawk Institute of Space Sciences (HISS). Reduction of the lunar measurement data will be done by Tom Stone of the U.S. Geological Survey's Lunar Calibration facility and a demonstration of results application will be done by Gene Eplee (616). Guidance for the project will be provided by Mary Cleave and Chuck McClain, formerly of GSFC.

PROPOSALS: *LISTING OF PROPOSALS AWARDED AND SUBMITTED*

AWARDED

Agency	UMBC Role	Name	Solicitation/Sponsor	Title
NASA	Co-I	Erricos Pavlis	Space Geodesy Research ROSES	Geodetic System Ties Using a CubeSat Constellation
NASA	PI	Huisheng Bian	Atmospheric Composition A.19	The effect of atmospheric aerosols and clouds on Amazon forest productivity
NASA	PI	Kevin Turpie	Airborne Instrument Technology Transition (NNH16ZDA001N-AITT)	Development of a Highly Accurate Lunar Spectral Irradiance Measurement Capability The Airborne Lunar Spectral Irradiance Instrument (air-LUSI)
NASA	Co-I	Stephen Nicolls	Modeling and Analysis Program	Analysis of the representation of the vertical structure of the Saharan Air Layer over northern Africa and the eastern Atlantic using MERRA-2 and NU-WRF
NASA	PI	Adriana Rocha Lima	ATMOSPHERIC COMPOSITION:AURA SCIENCE TEAM AND ATMOSPHERIC COMPOSITION MODELING AND ANALYSIS PROGRAM	Assessment of the spatial and temporal variability of mineral dust aerosols in the Middle East and North Africa using observations and modelling
NASA	Co-I	Kevin Turpie	Biodiversity	From Arboreal to Benthic Communities: the ABCs of Land to Ocean Biodiversity Observations

SUBMITTED

Agency	UMBC Role	Name	Solicitation/Sponsor	Title
NASA	Co-I	Jay Herman	NNH16ZDA001N-ISE (E.5 Interdisciplinary Science for Eclipse 2017)	Using the 2017 Eclipse viewed by DSCOVR/EPIC & NISTAR from above and spectral and broadband irradiance instruments from below to perform a 3-D radiative transfer closure experiment
	Co-I	Huisheng Bian	Atmospheric Composition: Aura Science Team and Atmospheric Composition Modeling and Analysis Program, Solicitation: NNH16ZDA001N-ACMAP	Characterizing Aerosol Transport from Mid-Latitudes to Polar Regions with Twin Spaceborne Lidars and GEOS-5 Model
	Collabo	Glenn	ROSES MAP	“Coupled Predictive Fire Emissions and

	rator	Wolfe		Interactive Aerosol and Greenhouse Gas Chemistry (“Quick Chemistry”) in the GEOS-5 Earth System Model.”
NASA	PI	Vanderlei Martins	NASA Earth and Space Science Fellowship (NESSF) Program	Retrievals of Aerosol and Cloud Droplet Microphysical Properties with the Hyper-Angular Rainbow Polarimeter (HARP)
NASA	Co-I	Vanderlei Martins	NNH16ZDA001N-AIST: Advanced Information Systems Technology	A High-Efficiency Multi-band Communication System to support CubeSat Science
NASA	PI	Vanderlei Martins	NNH16ZDA001N-AIST: Advanced Information Systems Technology	Development of a Nano-Satellite Science Consolidation Center
NASA	PI	Petya Campbell /Fred Huemmrich	Utilization of Airborne Visible/Infrared Imaging Spectrometer - Next Generation Data from an Airborne Campaign in India	From Arboreal to Benthic Communities: the ABCs of Land to Ocean Biodiversity Observations
NSF	Co-I	Belay Demoz	Atmospheric Chemistry	Collaborative Proposal: Investigating the Long-range transport of tropospheric ozone to the Tropical South Atlantic (STA) from continental natural and anthropogenic sources
NASA	Co-I	Petya Campbell /Fred Huemmrich	NNH16ZDA001N-AIST: Advanced Information Systems Technology	Machine Learning for Detecting Fires from Cubesats in Space Principal Investigator
NASA	PI	Mustafa Aksoy	NNH16ZDA001N-AIST: Advanced Information Systems Technology	Calibration Framework for Constellations of Similar Microwave Sensors
NASA	Co-I	Amita Mehta	GROUP ON EARTH OBSERVATIONS WORK PROGRAMME	Building Capacity to Monitor Water Quality of Fresh Water Bodies in Latin America
NASA	PI	Pengwang Zhai	REMOTE SENSING OF WATER QUALITY	Atmospheric correction for complex scenes using co-located polarimetric and ocean color observations
NASA	Co-I	Petya Campbell /Fred Huemmrich	NNH16ZDA001N-AIST: Advanced Information Systems Technology	Coordinated Multi-Instrument UAS Constellations to Monitor Biophysical Traits, Function and Structure in Operational Field Environments

MEETINGS AND FIELD WORK ATTENDED: *LISTING OF MEETINGS, TRAVEL*

January 2017 Travel

Traveler	Type/Destination	Begin Travel	End Travel	Purpose
Tokay, Ali	MD to Seattle, WA	1/21/2017	1/26/2017	Attend/present AMS Annual meeting
Vermeesch, Kevin	MD to Seattle, WA	1/22/2017	1/27/2017	Attend/present AMS Annual meeting
Remer, Lorraine	MD to MCO, Florida	1/16/2017	1/19/2017	PACE Science Team meeting and workshop
St. Pe, Alexandra	DC to Seattle, WA	1/20/2017	1/26/2017	Attend/present AMS Annual meeting
Lucadamo, David	MD to San Diego, CA	1/17/2017	1/20/2017	SRA International - Basics of Research Administration
Nicholls, Stephen	MD to Seattle, WA	1/22/2017	1/27/2017	Attend/present AMS Annual meeting
Tucker, Benjamin	MD to Seattle, WA	1/20/2017	1/27/2017	Attend/present AMS Annual meeting
Lee, Jae	MD to Seattle, WA	1/21/2017	1/26/2017	Attend/present AMS Annual meeting
Carroll, Brian	MD to Seattle, WA	1/20/2017	1/27/2017	Attend/present AMS Annual meeting
St. Clair, Jason	MD to Palmdale, CA	1/9/2017	1/14/2017	Support for the ATom-2 NASA aircraft campaign - Test Flight 1
Delgado, Ruben	MD to Seattle, WA	1/20/2017	1/27/2017	Attend/present AMS Annual meeting
Sasser, Christiana	MD to Seattle, WA	1/20/2017	1/28/2017	Attend/present AMS Annual meeting
Demoz, Belay	MD to Seattle, WA	1/21/2017	1/26/2017	Attend/present AMS Annual meeting
St. Clair, Jason	MD to Palmdale, CA	1/22/2017	1/30/2017	Support for the ATom-2 NASA aircraft campaign - Test Flight 2
Kruchten, Catherine	MD to NYC/CT	1/19/2017	1/23/2017	NASA's BEST Professional Development with GISS
Huemmrich, Karl	MD to Boulder, CO	1/16/2017	1/20/2017	Attend NASA ABoVE Airborne Campaign planning mtg & ABoVE Science Team mtg
Yuan, Tianle	MD to Seattle, WA	1/21/2017	1/26/2017	Attend/present AMS Annual meeting

February 2017 Travel

Traveler	Type/Destination	Begin Travel	End Travel	Purpose
Wolfe, Glenn	MD to Christchurch, NZ	2/3/2017	2/25/2017	Support of the ATom-II field campaign
Kruchten, Catherine	MD to NYC/CT	2/9/2017	2/13/2017	NASA's BEST Professional Development with GISS
Lee, Jae	MD to Denver, CO	2/21/2017	2/24/2017	Attend TRF/TIM and SRF/SIM workshop at LASP
Delgado, Ruben	MD to El Paso, TX	2/1/2017	2/4/2017	NOAA CREST Student Recruitment at the University of Texas, El Paso Career Fair
Remer, Lorraine	MD to Rehovot, Israel	2/12/2017	2/19/2017	Interactive visit to Dept of Earth and Planetary Sciences- Weizmann Institute for Science &present/participate in the Aerosol &Cloud Remote Sensing Workshop.
Borda, Roberto F.	MD to Logan, UT	2/13/2017	2/18/2017	Support for HARP Project Campaign
Kruchten,	MD to Wallops,	1/30/2017	2/1/2017	NASA's BEST Professional Development with Wallops staff

Catherine	VA			
Mehta, Amita	MD to Huntsville, AL	2/15/2017	2/17/2017	Attend training at NASA Marshall Space Flight Center
Vermeesch, Kevin	Local travel	2/8/2017	2/8/2017	Weather balloon retrieval
Campbell, Petya	DC to Limmasol, Cyprus, Greece	2/16/2017	2/26/2017	Invited Key-note speaker at an OPTIMISE workshop.

March 2017 Travel

Traveler	Type/Destination	Begin Travel	End Travel	Purpose
Kruchten, Catherine	MD to LA/Palmdale, CA	2/25/2017	3/3/2017	NASA's BEST Annual Kick-off Meeting
Campbell, Petya	DC to San Juan, PR	3/4/2017	3/11/2017	Participating in the GSFC FLARE - GiLiHT and FireFLy/Fluorescence campaign.
Huemmrich, Karl	MD to San Juan, PR	3/1/2017	3/11/2017	Support field campaign, making measurements to evaluate new aircraft instrument.
Casasanto, Valerie	MD to Seattle, WA	3/1/2017	3/6/2017	Attend the Polar Science Weekend at the Pacific Science Center - set up educational exhibits, run demos
Hoban, Susan	MD to Bellingham, WA	3/19/2017	3/24/2017	Work with Co-I on NASA NINAs grant to develop summer workshop for Native American educators.
Borda, Roberto F.	MD to Logan, UT	3/7/2017	3/10/2017	Support for HARP Project Campaign
Zhang, Zhibo	Local travel to UMD-CP	3/19/2017	3/25/2017	Attend 16th Electromagnetic and Light Scattering Conference
Zhang, Zhibo	MD to Vienna, VA	3/13/2017	3/17/2017	2017 ARM/ASR Joint User Facility PI Meeting
St. Pe, Alexandra	Local travel - Baltimore	3/7/2017	3/7/2017	Attend BNOW breakfast meeting with Ruben Delgado.
Huemmrich, Karl	Local travel to Bethesda, MD	3/27/2017	3/30/2017	Attend North American Carbon Program & Ameriflux meetings
Casasanto, Valerie	MD to Paris, FR	3/18/2017	3/25/2017	International Astronautical Congress Planning Meetings

EDUCATION AND OUTREACH: *LISTING OF OUTREACH, GRADUATE SEMINAR, COURSES TAUGHT AND ADVISEMENT, AND STUDENT ACCOMPLISHMENTS.*

Recent Affiliations: None this quarter.

Courses taught by JCET Faculty & Staff in Spring 2017:

PHYS 622: Cloud Physics, **Demoz** (3 credits)
PHYS 640: Computational Physics, **Varnai** (3 credits)
PHYS 112: Basic Physics II, **Hoban** (4 credits)
SOCY 101: Basic Concepts in Sociology, **Evans** (1 credit)

JCET Seminar:

The 2016-17 cohort of eight JCET graduate students are exploring the science behind the American Physical Society's Statement on Earth's Changing Climate. Guest speakers set the stage by discussing

various aspects of Earth science. The presentations and background materials are available at the links given below. The JCET Seminar has become an important component in the professional development of these young scientists. The seminar series is open to the public and is led and organized by Dr. Susan Hoban, Associate Director of JCET.

Link to Seminar schedule
Link to Seminar Website

JCET Student Activities:

JCET Graduate Students Brian Carroll, Brent McBride, and Lipi Mukherjee are the primary organizers of the upcoming Earth Day Symposium.

REPORTED PUBLICATIONS : *LISTING OF REPORTS AND ARTICLES*

BIAN, HUISHENG

Kim, D., Chin, M., Diehl, T., Bian, H., Remer, L. A., Yu, H., Brown, M. E., Stockwell, W. R. (2017). The role of surface wind and vegetation cover in multi-decadal variations of dust emission in the Sahara and Sahel. *Atmos. Environ., 148*, 282-296.

DESOUZA-MACHADO, SERGIO G., HEPPLEWHITE, CHRISTOPHER L. & TANGBORN, ANDREW V.

De Souza-Machado, S. G., Tangborn, A. V., Sura, P., Hepplewhite, C. L., Strow, L. L. (in press). Non-Gaussian analysis of observations from the Atmospheric Infrared Sounder compared with ERA and MERRA reanalyses. *Journal of Applied Meteorology and Climatology*. http://journals.ametsoc.org/doi/abs/10.1175/JAMC-D-16-0278.1

DELGADO, RUBEN

Lundquist, J., Wilczak, J., Ashton, R., Bianco, L., Brewer, A., Choukulkar, A., Clifton, A., Debnath, M., Delgado, R., Friedrich, K., Gunter, S., Hamidi, A., Valerio, G., Kaushik, A., Kosovic, B., Langan, P., Lass, A., Lavin, J., Lee, Y., McCaffrey, K., Newsom, R., Noone, D., Oncley, S., Quelet, P., Sandberg, S., Schroeder, J., Shaw, W., Sparling, L. C., St. Marin, C., St. Pe, A., Strobach, E., Tay, K., Vanderwende, B., Weickmann, A., Wolfe, D., Worsnop, R. (2017). Assessing State-of-the-Art Capabilities for Probing the Atmospheric Boundary Layer : the XPIA Field Campaign. *Bulletin of the American Meteorological Society*. http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-15-00151.1

NICHOLLS, STEPHEN D.

Nicholls, S., Decker, S. G., Tao, W.-K., Lang, S. E., Shi, J. J., Mohr, K. I. (2017). Influence of Bulk Microphysics Schemes upon Weather Research and Forecasting (WRF) Version 3.6.1 Nor'easter Simulations. *Geoscientific Model Development, 10*, 17. http://www.geosci-model-dev.net/10/1033/2017/gmd-10-1033-2017.pdf

WANG, YUJIE

Hilker, T., Galvão, L. S., Aragão, L. E. O. C., Moura, Y., Amaral, C. H. d., Lyapustin, A. I., Wu, J., Albert, L. P., Ferreira, M., Anderson, L. O., Santos, V., Prohaska, N., Tribuzy, E., Ceron, J. V. B., Saleska, S., Wang, Y., Gonçalves, J. F. d. C., R. C. O. J., J. V. F. C. R., Garcia, M. (2017). Vegetation chlorophyll estimates in the Amazon from multi-angle MODIS observations and canopy reflectance model. *International Journal of Applied Earth Observation and Geoinformation*(DOI: 10.1016/j.jag.2017.01.014).

WERNER, FRANK

Wolf, K., Ehrlich, A., Hüneke, T., Pfeilsticker, K., Werner, F., Wirth, M., Wendisch, M. (2017). Potential of remote sensing of cirrus optical thickness by airborne spectral radiance measurements in different viewing angles and nadir geometry. *Atmos. Chem. Phys., 17*, 4283–4303.

Voigt, C., Schumann, U., Minikin, A., Abdelmonem, A., Afchine, A., Borrmann, S., Boettcher, M., Buchholz, B., Bugliaro, L., Costa, A., Curtius, J., Dollner, M., Dörnbrack, A., Dreiling, V., Ebert, V., Ehrlich, A., Fix, A., Forster, L., Frank, F., Fütterer, D., Giez, A., Graf, K., Grooß, J.-U., Groß, S., Heimerl, K., Heinold, B., Hüneke, T., Järvinen, E., Jurkat, T., Kaufmann, S., Kenntner, M., Klingebiel, M., Klimach, T., Kohl, R., Krämer, M., Krisna, T. C., Luebke, A., Mayer, B., Mertes, S., Molleker, S., Petzold, A., Pfeilsticker, K., Port, M., Rapp, M., Reutter, P., Rolf, C., Rose, D., Sauer, D., Schäfler, A., Schlage, R., Schnaiter, M., Schneider, J., Spelten, N., Spichtinger, P., Stock, P., Walser, A., Weigel, R., Weinzierl, B., Wendisch, M., Werner, F., Wernli, H., Wirth, M., Zahn, A., Ziereis, H., Zöger, M. (2017). ML-CIRRUS-The airborne experiment on natural cirrus and contrail cirrus with the high-altitude long-range research aircraft HALO. *Bulletin of the American Meteorological Society, 98*, 271–288.

Schäfer, M., Bierwirth, E., Ehrlich, A., Jäkel, E., Werner, F., Wendisch, M. (2017). Directional, Horizontal Inhomogeneities of Cloud Optical Thickness Fields Retrieved from Ground-Based and Airborne Spectral Imaging. *Atmospheric Chemistry and Physics, 17*.

Zhang, Z., Werner, F., Cho, H.-M., Wind, G., Platnick, S., Ackerman, A. S., Di Girolamo, L., Marshak, A., Meyer, K. (2017). *A framework for quantifying the impacts of sub-pixel reflectance variance and covariance on cloud optical thickness and effective radius retrievals based on the bi-spectral method* (1st ed., vol. 1810, pp. 030002). AIP Conference Proceedings. http://aip.scitation.org/doi/abs/10.1063/1.4975502

YUAN, TIANLE

Yuan, T. (in press). On the global character of overlap between low and high clouds. *JGR*.

UPCOMING EVENTS: *A "HEADS-UP" SECTION FOR UPCOMING EVENTS.*

Earth Day Symposium

In conjunction with the UMBC Atmospheric Physics Program, JCET is contributing to the first annual Earth Day Symposium in the Physics Department at UMBC on Friday, April 21, 2017. The goal of the symposium is to expose graduate students with interests in atmospheric studies to research opportunities in and connected to the Atmospheric Physics program.

The symposium will begin at 9:00 AM in Physics Room 401, and will include sessions of short research talks by Atmospheric Physics faculty, JCET, GSCF and externally affiliated scientists, followed by an afternoon poster session for graduate students and professionals to showcase their research. During the day there will be various activities, including Physics department lab tours and a weather balloon launch demonstration. Lunch and coffee breaks will be provided.

PERSONNEL CHANGES:

LISTING OF PROMOTIONS:

None this quarter.

HIRES:

Dr. Reem Hannun, Postdoctoral Research Associate, Task 155, Code 614,

DEPARTURES:

Dr. Simone Lolli, Research Assistant Professor, 1/27/17, Visa Issues