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A healthy outlook

NASA's FY16 budget funds JPL's ongoing work, future initiatives

By Mark Whalen

The White House's budget request for fiscal year 2016 includes full funding for all of JPL's ongoing missions as well as continuing support for development of a mission to Jupiter's moon Europa next decade.

"Last year was an exciting year and I think this year is going to be even more exciting," JPL Director Charles Elachi told employees in an all-hands meeting.

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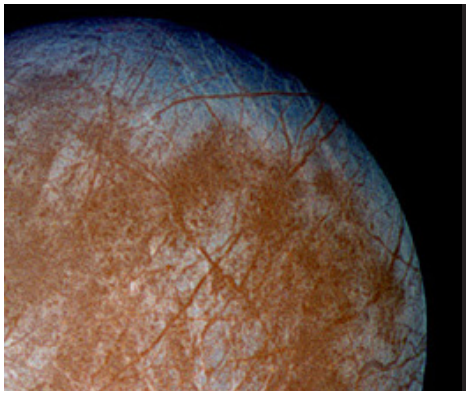

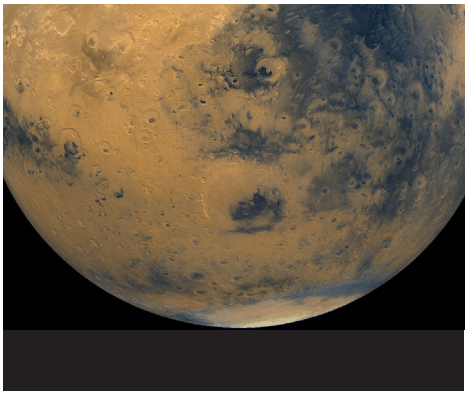

The request includes about $5.2 billion for science overall, of which $1.95 billion is requested for Earth science and $1.36 billion for planetary science. NASA's total FY 2016 budget requests $18.5 billion.

"NASA did pretty well in this very tight budget environment," said Elachi, noting an increase of $450 million relative to FY 14. "That shows the strong support NASA received" in the White House request, he said.

The planetary budget includes $30 million to proceed on formulation of a Europa mission, which could launch in the 2022 to 2024 timeframe. Elachi said JPL would provide NASA with key decision points on mission planning this spring. He noted the strong support from NASA senior management for the mission.

Europa—which along with Mars 2020 is the highest priority mission of the most recent National Research Council decadal survey—is "an anchor for the long-term exploration of the icy satellites," said Elachi.

NASA's Earth science program also received strong support in the budget request, which includes formulation of several new JPL-led missions: NASA-ISRO Synthetic Aperture Radar, or NISAR, a partnership with the Indian Space Research Organization; Orbiting Carbon Observatory 3; the Surface Water Ocean Topography mission; and a Gravity Recovery and Climate Experiment follow-on mission.

All ongoing Mars activities and operations at JPL are fully funded, as is the continuing development of the Mars 2020 rover.

JPL will be in a good position to contribute to NASA's efforts to take humans to the surface of Mars, said Elachi. Such plans can benefit from at least two technology projects the Lab is carrying out. The Low-Density Supersonic Decelerator will continue tests begun last year of entry, descent and landing technologies. In addition, JPL is developing an in-situ resource utilization experiment that consumes electricity in order to produce oxygen on Mars, set to fly on Mars 2020. The system could later be used to produce oxygen both for life-sustaining activities for human travelers and to provide liquid oxygen needed to burn the rocket fuel for a return trip to Earth.

Also, Elachi said, a major, long-term objective for the end of this decade is to demonstrate an optical communications link.

"One key element in demonstrating that technology is the Asteroid Retrieval Mission," Elachi said. "In order to deploy assets on Mars for humans, you need a lot of tonnage. Electric propulsion is the most efficient way to transport heavy mass."

The proposed asteroid mission's two major objectives, he added, are illustrating high-power electric propulsion and providing a platform to assess astronauts spending a significant amount of time away from Earth.

"Develop the technology, do the demonstration, develop the capability, and that will enable us for some time in the future," said Elachi.

Future missions in the JPL pipeline also include a coronagraph for the Wide-Field Infrared Survey Telescope, or WFIRST, led by Goddard Space Flight Center. "This will enable us not only to detect planets but to start getting images," Elachi said. "That's not crazy. Technologically, I remember 15 years ago I chaired a group looking into whether it was possible to detect exoplanets. There were a few believers. Today, it's a common thing."

Elachi also noted that the budget includes a potential 2017 start for construction of a new JPL Flight Electronics Integration Facility. "This shows NASA's commitment to make sure we have the appropriate infrastructure" to get the job done, the director said.

Elachi encouraged JPL staff to complete an employee engagement survey, underway through Feb. 25. A similar survey 10 years ago led to the popular 9/80 workweek. "We take the surveys very seriously," he said. "What are the important things for you?"

Elachi's state of the Lab presentation is available on JPL Tube, *https://jpltube.jpl.nasa.gov.* For more information on the FY 16 budget, please visit *www.nasa.gov.* ■

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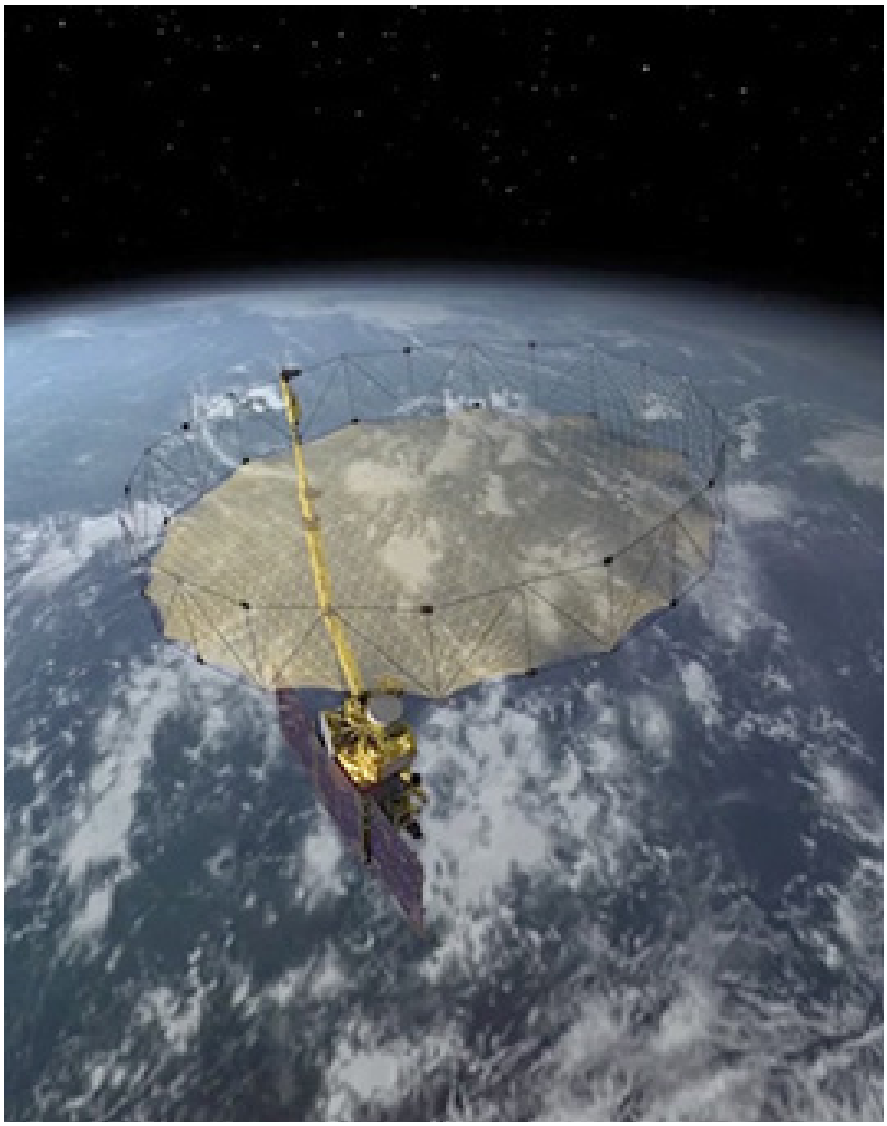
Moisture mapper takes to orbit

Large, rotating antenna enables soil mission | By Mark Whalen

JPL's Soil Moisture Active Passive mission launched Saturday, Jan. 31 from Vandenberg Air Force Base to begin its quest to provide data that will improve our understanding of our planet's water, energy and carbon cycles.

The mission will potentially reduce uncertainties in climate forecasts and also help a diverse array of everyday practical applications including weather, drought monitoring and flood forecasts.

A first launch attempt Thursday, Jan. 29 was scrubbed due to high-level wind shears. Minor repairs to the Delta II rocket's booster then pushed the launch another day to Jan. 31.



Also deployed from the Delta II was the JPL cubesat GRIFEX, conducting an engineering test of a JPL-developed integrated circuit designed eventually to enable monitoring of atmospheric chemistry and air pollution. Following launch, several thousand data packets have been downlinked and decoded by both the University of Michigan, the prime GRIFEX operations site, and by amateur radio operators around the world.

SMAP will map the entire globe every two to three days for at least three years. It will provide the most accurate and highest-resolution maps of soil moisture ever obtained from space, giving scientists a new capability to improve climate change predictions and help extreme weather, floods and drought forecasts.

Once in operation following its in-orbit checkout phase, expected to be completed at 90 days after launch, the JPL-built mission will represent the state of the art for remote sensing of soil moisture.

The European Space Agency's Soil Moisture Ocean Salinity mission, launched in 2009 and still operating, uses a radiometer that measures brightness temperature changes on Earth's surface.

SMAP, however, adds a sophisticated radar to the radiometer measurement, resulting in much higher resolution and comparable accuracy, noted Project Scientist Simon Yueh. "To achieve the

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SMAP *Continued from page 3*

high resolution, we needed to combine radiometer data with very high-resolution radar measurements."

Combing active (radar) with passive (radiometer) measurements will enable SMAP to create a global map of soil moisture from space with about six-mile (nine-kilometer) resolution, added Yueh.

"Now, instead of just being limited to the radiometer resolution, which would be 40 to 50 kilometers, we can resolve soil moisture down to nine kilometers—that's better than a factor of five improvement in spatial resolution," said Project Manager Kent Kellogg. "The radar also gives us the ability to determine whether the soil moisture is frozen or thawed."

SMAP will detect variations in the timing of thaws and freezes each spring and fall. That will alert scientists to changes in the length of growing seasons, which in turn will help them more accurately estimate how much carbon the vegetation is removing from Earth's atmosphere each year.

The mission's enabling technology is a deployable reflector antenna, which will swoop high above the spacecraft, held by a support boom. Stowed into a one-foot-diameter cylinder at launch, the antenna deploys out to almost 20 feet for operations and easily supports both the radar and radiometer with the same aperture as it spins at 14.7 RPM.

"If we had an active antenna array instead, we would have to have two complete sets of array elements and electronics, which would be too heavy," said Kellogg. "Our reflector is much more lightweight, which is ideal for our spacecraft."

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Project Manager Kent Kellogg

Peak staffing on the mission was about 625 JPL people, equivalent to about 350 full-time staffers, said Kellogg. Currently, about 435 JPL people work on SMAP full- or part-time.

Yueh said the science team comprises 20 members, including representatives from Canada, France, Italy and Australia.

A key group of SMAP users—organizations, governments and others that have expressed a strong desire to have quick access to the mission's data—are known as "early adopters." There are currently 45 of them, 27 based in the United States.

"These groups are interested in a broad range of topics including agricultural productivity, human health and national security," said Kellogg. He cited as examples the United Nations World Food Program using soil moisture information to improve flood forecasts in Africa and Texas A&M University's studies of the impact of hurricanes on power outages.

"Some of our early adopters—like Agri-food Canada and the U.S. National Agricultural Statistical Service—now have prototype systems in place, ready to ingest SMAP products immediately," added Kellogg. "That's been the goal of this program, to help folks be ready to use our data quickly once it's available."

For more information on the mission, visit *http://smap.jpl.nasa.gov.* ■

News Briefs

Two JPLers named to National Academy of Engineering

Dan Goebel (left), Graeme Stephens

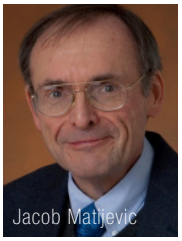
Graeme Stephens, the director for the Center for Climate Sciences at JPL, and Dan Goebel, a senior research scientist who develops technologies for deep-space missions, have been elected to the National Academy of Engineering, the highest professional distinction for engineers.

The pair join 65 other U.S. members and 12 foreign members as the newest additions to the organization, which now has 2,263 U.S. members and 221 foreign members.

Stephens, with JPL since 2010, is being honored for his elucidation of Earth's cloud system and radiation balance. His research activities focus on atmospheric radiation, including the application of remote sensing to understand the role of hydrological processes in climate change. He is the principal investigator of JPL's CloudSat mission and was involved in the early development of the Orbiting Carbon Observatory 2 mission, launched last year. He is an adjunct professor at the University of Reading in England, and a professor at Colorado State University, Fort Collins.

Goebel is being honored for his contributions to low-temperature plasma sources for thin-film manufacturing, plasma materials interactions and electric propulsion. He is responsible for the development of high-efficiency electric thrusters, advanced long-life propulsion components and thruster-life model validation for deep-space missions. He is a fellow of the American Institute of Aeronautics and Astronautics, the Institute of Electrical and Electronics Engineers and the American Physical Society; an adjunct professor at UCLA; and the author of more than 120 technical papers and one book on electric propulsion.

Matijevic to receive posthumous award


Jacob Matijevic

The late Jacob Matijevic, surface operations systems chief engineer for Mars Science Laboratory and the Curiosity rover, has been selected for the 2015 Lifetime Achievement Award from his alma mater, the Illinois Institute of Technology.

The award is bestowed posthumously by the university to alumni who have made outstanding contributions in their field and have achieved recognition by colleagues. Matijevic, who graduated from the college in 1969, died Aug. 20, 2012 at age 64.

Matijevic also was a lead engineer for all of JPL's previous Mars rovers: Sojourner, Spirit and Opportunity. The Opportunity team honored Matijevic by naming in his memory an important site with intriguing geological features overlooking Endeavour Crater.

The award will be bestowed in April at the college's alumni awards ceremony.

Early-career medal to postdoc Wang

JPL postdoc researcher Yuan Wang been awarded an Early Career Scientist Medal from the International Association of Meteorology and Atmospheric Sciences.

The organization will honor Wang for his "outstanding contributions to the atmospheric sciences" during the Assembly of the International Union of Geodesy and Geophysics, which will be held in Prague, Czech Republic in June and July 2015.

Yuan Wang

Wang joined JPL in September 2013 after earning a Ph.D. from Texas A&M University that year. His previous honors include NASA Graduate Fellowships for three consecutive years, an American Geophysical Union scientific refereeing award and a Ph.D. dissertation award from the Chinese-American Oceanic and Atmospheric Association.

Komjathy named institute fellow

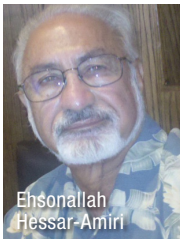
Attila Komjathy

For his contributions to remote sensing of Earth's ionosphere using global navigation satellite system signals, Attila Komjathy of the Ionospheric and Atmospheric Remote Sensing Group has been named a fellow of the Institute of Navigation.

Komjathy, with JPL since 2001, is the technical lead for the design and implementation of algorithms that provide high-accuracy ionospheric delay estimates for the Deep Space Tracking Network and is manager and technical lead for JPL's deliveries of GPS satellite differential hardware bias values to the U.S. Air Force.

Komjathy earned a Ph.D. from the Department of Geodesy and Geomatics Engineering of the University of New Brunswick, Canada. In 2008, GPS World named Komjathy among the "50+ Leaders to Watch."

Passings


Ehsonallah Hessar-Amiri

Ehsanollah Hessar-Amiri, 72, former supervisor in the Information Technologies & Software Systems Division, died Oct. 9.

Hessar-Amiri worked at JPL from 1990 to 2006, serving in several managerial roles. He is survived by his wife, Jennifer; son Marc, daughter Royya Guevarra and granddaughter Bianca. Services were held at Memory Garden Memorial Park & Mortuary in Brea, Calif.

Robert Fuzie, 82, former field engineer manager at the Goldstone Tracking Station of the Deep Space Network, died Nov. 27.

Fuzie was a JPL employee from 1984 to 1998.

He is survived by daughters Annamarie and Cynthia, son Brian, grandchildren Amanda, Alisa, Lyndsay, Robin and Brian Jr.; great-grandchildren Kloe, Kailie and Kyle Zeller. Services were private.

Gene Winn

Gene Winn, 83, a retired engineer from the Office of Telecommunications and Data Acquisition of the Deep Space Network, died Feb. 4.

Winn worked at JPL from 1974 to 1996 and contracted for the network after retirement. He was responsible for the maintenance and engineering support for the DSN stations at Goldstone, Calif. and Madrid, Spain. He managed the Deep Space Network Engineering Section and later managed operations engineering.

Winn is survived by his wife, Mary; sister Joanne; children John Winn, Robin Williams, Mike Winn, Angie Esser, Tacy Faughnder and their spouses; nine grandchildren, and nine great-grandchildren.

Letters

Thank you to my JPL colleagues and friends for your condolences. My dad's cancer diagnosis and passing have been so sudden and difficult to us. Your thoughts, prayers and support during the passing of my father on Dec. 27 are greatly appreciated. Thank you for the beautiful flowers sent to the church for my dad and orchid sent to my home.

Thy Tran

Thanks to all my JPL colleagues and friends for all your condolences, your expressions of support and the beautiful plant sent upon the passing of my mother.

Eric B. Hochberg

To my colleagues at JPL, I would like to thank you all for the condolences that I received on the passing of my father, Jim. My JPL family has been a wonderful support to me, so please accept my thanks for your thoughts and prayers, and for the beautiful plant.

David Wagner

Thank you, my JPL colleagues and friends, for your kindness and condolences. My father's death, coming three months after my mother's death, has been a very difficult blow. Thank you also for the beautiful plant and for the card and gift from my Radar Section co-workers.

Elaine Chapin

To JPL, a much-appreciated "thank you" for the gorgeous plant following the death of my mom. Per her last wishes we celebrated her life with homemade soupe à l'oignon gratinée, boeuf bourguignon, a good Côtes du Rhône, and finished with chocolate soufflé topped with sauce au chocolat. Many thanks.

David Rosing

Retirees

The following employees retired in January:

Noemi Portugues, 29 years, Section 7600; **Mark Watson**, 14 years, Section 2724.

Classifieds

Ads submitted Jan. 31–Feb. 12. To submit an ad, e-mail *universe@jpl.nasa.gov*.

For Sale

BOOK, 'Secrets of Mental Math': one of the Great Courses, course number 1406; original packaging, never opened. $60. Paul: 626-720-1380 or pbwillis46@gmail.com.

CAMERA, Canon G-11, excellent compact point and shoot, digital zoom, RAW format available, lightly used, factory box with all cables/manuals/software, two LiON batteries, charger, extension tubes, filters; $200 obo. Paul: 626-720-1380 or pbwillis46@gmail.com.

DESK, a beautiful example of Art-Deco Venetian style, vg condition, measurements 44 x 27 x height 40; see http://losangeles.craigslist.org/sfv/fuo/4864752642.html; original price $2,250, sell for $750/obo. 818-736-1169.

PIANO, Yamaha P70, 88 keys, digital, in great condition, black, includes music rest, adjustable double x-frame stand and bench, FC-3 sustain pedal, manual; see http://usa.yamaha.com/products/musical-instruments/keyboards/digitalpianos/p_series/p_70/; $400. Doris: text 626-617-3054 or dlamoris@gmail.com.

WIRELESS ROUTER, Verizon Actiontec, includes charger, see http://losangeles.craigslist.org/sgv/ele/4888690524.html, $20. pmkroger@vsrizon.net, 310-850-7845.

Vehicles/Accessories

'00 CHEVY Corvette coupe, one owner, only 29,000 miles, black/black, 6 speed, HUD, Z-51 suspension, multi-CD, beautiful original condition, $14,500/obo. reverb202@yahoo.com.

'83 LARSON boat, 16,' 90 hp Mercury outboard rebuilt to 190 hp, reupholstered, carpeted, garaged, fresh water, with trailer, $2,000. bean@att.net, 805-239-8871, Jim Bean.

Wanted

SPACE INFO/memorabilia, U.S. & other countries, past/present, for personal use (http://www.youtube.com/watch?v=S7PvjGp7mCU). mrayman@alumni.princeton.edu, 818-790-8523, Marc Rayman.

Lost & Found

LOST: activity notes, April 2006–March 2007. SOSNotez@riseup.net.

Real Estate for Sale

PASADENA, beautiful 4 bedroom, 2 bath, single family home; cathedral ceilings, fireplace, marble floors in kitchen & bathrooms, hardwood laminate floors, fresh carpet, central & heating units & 2-car attached garage; appliances (refrigerator, stainless steel Frigidaire range & dishwasher) & DIRECTV satellite ready; walking distance to JPL, Rose Bowl & Angeles National Forest; $630,000. 281-798-4427, lancewyndon@yahoo.com, Lance.

For Rent

ALTADENA: updated detached rear house, 1 bdrm., 1 bath; includes small garage and utilities; freshly painted, new mini blinds/floors/carpet, newly tiled bathroom, stove & refrig., 3 large closets, window air conditioners in living room & bedroom, wall heater in living room; very comfortable, quiet & private w/ nice views + natural light; convenient to all services, 10 minutes to JPL; $1,500/month + $1,000 security deposit. 626-688-0655.

ALTADENA, one room in a lovely 3-bd./2-bath house, big backyard, hardwood floor, big closet, furnished or unfurnished, shared bathroom, kitchen and laundry privileges; 5-minute drive to JPL, close to public t ransportation; short- or long-term lease available; must like dogs and be very clean; $750 furnished, $700 not furnished, including utilities + $650 deposit. 626-712-3451.

HIGHLAND PARK (north), 3-bedrm., 2-bath house with lg. private backyard; quiet cul de sac, 15 min. from JPL; recently remodeled: new kitchen/master bedroom suite/bathrooms/central air/instant hot water/range/tile and wood floors/blinds, brand new triple-pane windows; 1-car garage plus 2-car driveway; closest cross streets are Ave. 54 and Coringa; ask for JPL discount w/long-term lease. 626-379-7255 (cell) or 626-403-0446 (home).

MONROVIA condo, 1 bedroom /1 bath, beautifully appointed; in cozy downtown, steps from markets, restaurants, pubs, banks, cinema and more; 3/4 mile from 210 fwy. and future Gold Line station; includes washer/dryer and 2 parking places in secure garage; no smoke/pets; $1,750 + security dep. 626-303-3151.

Vacation Rentals

BIG BEAR lakefront, luxury townhome, 2 decks, tennis, pool/spa, beautiful master bdrm. suite, sleeps 6. 949-786-6548.

BIG BEAR LAKE, newer cabin, 3 bedrooms, 3 baths, sleeps 9, knotty pine on quiet cul-de-sac, 50" HDTV w/HBO, spa tub in master, central heat/AC, BBQ, WiFi, 2-car garage, no pets. 818-952-2045.

BIG BEAR LAKE, huge mountain chalet, 8 bdrms., 7.5 baths (2 spa tubs), sleeps 18, cable TV in each room, pool table, deluxe kitchen w/prof appliances, <1 mi. to slopes, no pets. 818-952-2045.

JACKSON HOLE, WY: Luxurious bed and breakfast nestled on 3 acres of solitude on the Snake River and down the road from the Jackson Hole Mountain Resort and the south entrance to Grand Teton National Park; see http://www.bentwoodinn.com/; mention JPL for employee discount. info@bentwoodinn.com, 307-739-1411.

MAMMOTH, Snowcreek, 2 bd., 2 ba. + loft, sleeps 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount, no pets. 626-798-9222, 626-794-0455 or valeriee@caltech.edu.

MAMMOTH, Snowcrk, beautiful updated condo, 2 bd., 2 ba. + loft (slps. 6-8), great loc. by pond & meadow, new appliances, TVs, DVD players, free wireless Internet access + washer/dryer, no pets. 818-952-2696 or BigMtnPrettySky@gmail.com.

OCEANSIDE beachfront condo, charming 1 bd., panoramic view, walk to pier or harbor, pool/spa, game room, sleeps 4. 949-786-6548.

OCEANSIDE white-water view beach condo; virtual tour: http://www.previewfirst.com/mls/ 33034; 2 bd., 2 ba., sleeps 6; well decorated and equip'd: boogie boards, wet suits, full kitchen, all linens, beach towels; Wi-Fi ready, new flat-screen TVs, daily paper, grocery stores nearby; 2-min. walk to sand, no roads; JPL and Caltech rates: winter $1,195/week, summer $2,150/week; monthly and nightly rates avail.able, reserve with $500 deposit; see www.beachvisitors.com. 760-433-4459, Grace; 831-425-5114, Ginger.

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