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Samuel Malloy

EARTH OBSERVATION FOR ONE HEALTH: A DECISION-MAKING GUIDE

One Health is an emerging concept in the health sciences that approaches human, animal and environmental health from a single framework. This policy approach is grounded in the knowledge that approximately 70 percent of emerging diseases in humans originate from other species, and that this species crossover is precipitated by stresses to environmental systems such as habitat and biodiversity loss (Jones et al., 2008). Space-based satellite remote sensing tools apply well to this approach, due to the multitude of variables that can be measured across borders in real-time. However, the task of applying the correct combination of space-based remote sensing systems, data analysis and infrastructure to One Health projects (such as real-time disease surveillance) is an onerous task for decision-makers in the field. This paper presents a summary of the available information on satellite remote sensing data sources relevant to the One Health approach. Tradeoffs among cost, property rights, accuracy and availability of space-based remote sensing data sources are evaluated, with optimization strategies presented for specific One Health surveillance and response contexts. This analysis will guide the decision-making process for leaders in the health and environmental sciences as they incorporate and renew satellite remote sensing tools in their systems architecture.

Kayleigh Gordon

TECHNICAL CAPABILITIES OF CHINESE LAUNCH VEHICLES

This paper synthesizes the technical capabilities of the current fleet of Chinese launch vehicles, specifically the Long March 4, 5, 6, 7 and 11 families. This paper articulates the types of missions each rocket has performed, and where each launch vehicle may be applied for future missions. Other topics included are the technical strengths and limitations of each launch vehicle such as payload weights and achievable orbits. Additionally, the types of payloads are considered when determining which rocket family would be best for launching the BeiDou Navigation Satellite System, the Tiangong space stations, and taikonauts, etc. Lastly, this paper compares the capabilities and mission applications to those of other leading space-faring nations.



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Ariadna Martínez González

SPACE-BASED REMOTE SENSING TO HELP MEASURING EFFECTIVENESS OF FARM POLICIES ON AGRICULTURAL PRODUCTIVITY AND INCOME DISTRIBUTION: THE CASE OF MEXICO AND PROCAMPO

Our ongoing research focuses on measurement of the effectiveness of farm policies on agricultural productivity and income distribution in Mexico. Specifically, we focus on analyzing the effect of the most important agricultural subsidy program in Mexico - Program of Direct Supports to the Farmland (PROCAMPO) - on the productivity of farmers, on crop diversity, on land-use and on the income distribution among farmers. We achieve this by evaluating the impact of both the introduction of the program in 1994 and the different policy changes that it experienced until its more recent 2014 version: PROAGRO Productivo. This research relies on the valuable precision of data derived from space-based measurements and remote sensing, as well as from any other available information such as those available at INEGI and SAGARPA. The methods and conclusions of this research are applicable to explore the effectiveness of other farm policies either in Mexico, Latin America or other similar developing countries or regions.

This paper builds on current research, which examines the incidence of PROCAMPO on farmland rental rates with the purpose of exploring how much of this subsidy passes to the landlords, across the income distribution, through the rents they charge, and of indirectly evaluating to what extent does the program's payments are actually benefitting the poor farmers. This study uses data from a survey collected by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with Mexico's Ministry of Agriculture (SAGARPA) for the agricultural year 2008/2009. The results to date show that for the 75th quantile of farms, sorted by average rent per hectare, 25 cents of the marginal peso of PROCAMPO per hectare subsidy is reflected into increased rental rates. The incidence is 70 cents for the 90th quantile. This estimated incidence is similar to the one found by Kirwan (2009) and does not agree with the prediction from neoclassical models. As a result, we show that PROCAMPO is significantly absorbed by the richest quantiles on the income distribution and it is partially capitalized into higher rental rates, a result that raises some questions as to why are these richest quantiles getting this subsidy. Space-based remote sensing data will help address the possibility of other benefits or impacts in the lower quintiles, including improved crop yield and or diversification of crops, and changes in the amount or types of under cultivation.



Jonathan Grimm

COMMEMORATION OF THE LATE U.S. SENATOR AND ASTRONAUT JOHN GLENN

John Glenn gained his first hands-on experience as a pilot in the Korean War, during which he flew 63 combat missions. Right before the end of his service, Glenn was accepted to the U.S. Naval Test Pilot School. As a test pilot, he broke the record time for a flight from LA to New York. In 1959, after undergoing extensive physical and psychological tests as part of the recruiting process for NASA astronauts, he was selected as one of the Mercury Seven – the first class of American astronauts. In 1962, John Glenn made history as the first American to orbit the earth. This instantly established his place as a role model to countless children in America and around the world. With his experience and passion for the promotion of science and technology, he was elected to the U.S. Senate. Here he was able to use his influence to initiate bills for issues such as renewable energy and programs to help stimulate youth interest in science. Even as a Senator, Glenn couldn't resist another opportunity to travel to space. He flew to the ISS on space shuttle Discovery in 1998, late in his political career. John Glenn used his unique experience as one of the first humans to orbit our planet to help enrich the lives of as many people as he could by promoting education and shaping policy. In 2012, Glenn received the Presidential Medal of Freedom, the highest civilian honor in the U.S., for his contributions to the progression of space exploration and public policy as a Senator. This paper is a biographical investigation of Glenn's life of distinguished service to his country and the world, compiled to celebrate his memory and accomplishments.

Nick Salamon

APPLICATION OF VIRTUAL REALITY FOR CREW MENTAL HEALTH IN EXTENDED-DURATION SPACE MISSIONS

Human exploration of the solar system brings a host of environmental and engineering challenges. Among the most important factors in crew health and human performance is the maintenance of sustained mental health. The mental well-being of astronaut crews is a significant issue facing the sustainability and success of long-duration space missions, such as spending a long period of time on the Moon, Mars exploration, and/or eventual colonization of the solar system. If mental health is not properly addressed, these missions will be at risk. In this paper, we examine the uses of immersive virtual reality simulations in order to maintain healthy mental states in astronaut crews who are removed from the essential comforts typically associated with terrestrial life. Various methods of simulations and their administration are analyzed in the context of current research and knowledge in the field of psychology, with a specific focus on the environment faced by astronauts on long-term missions. The results of this investigation show that virtual reality should be considered an effective measure in the prevention of mental state deterioration in astronauts.



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Andrew J. Steen

INVESTIGATION OF SATELLITE CONSTELLATION CONFIGURATION FOR EARTH OBSERVATION USING SIERRA NEVADA DREAM CHASER® SPACECRAFT FOLLOWING LAUNCH TO ISS

We present here initial results from an investigation into the use of multiple Sierra Nevada Corp. Dream Chaser® platforms, following their launch to the International Space Station, as a distributed constellation for remote sensing and disaster response. The payload capability and delta-V ability of these spacecraft, combined with their reusability and prior launch to ISS under a commercial cargo delivery contract, opens up a unique and compelling method to provide significant global earth observation during quiescent times, as well as the ability to respond rapidly - including through significant spacecraft maneuvering - when disasters strike around the globe. Our paper documents initial orbital dynamics calculations, optimizations, and alternatives for a variety of configurations. We explore ground coverage and various response modalities when presented with specific-case disasters across the surface of the globe.

Jack DiGregorio

BUSINESS MODEL OF REMOTE SENSING AND DISASTER RESPONSE

We present a preliminary business model describing a global satellite and remote sensing system for earth monitoring and disaster response, using pre-launched hardware mounted on the Sierra Nevada Dream Chasers, based initially for the orbit of the International Space Station. The model addresses both quiescent observations and disaster operation modes for use when activated in conjunction with international-disaster charter. Some specific areas covered include spherical models of environmental disasters to investigate the best hibernation orbits; generic sensor databases that best fill the market gap; current rapid sensing systems and how they could be improved.