AIAA Houston Section

Dinner meeting of November 3, 2015

The emissions of the future rich must eventually equal the emissions of today's poor, …

Climate Change Engineering, Science & Public Policy

NEWSLETTER

Horizons, newsletter of AIAA Houston Section
www.aiaahouston.org
Article in work December 26, 2015
We have no Editor at the moment

We attracted an audience of about 60 people to our dinner meeting of November 3, 2015, with EventBrite and our AIAA Houston Section's website (event page) archiving some relevant information. The advertised subject: Climate Change Engineering, Science & Public Policy. Our

venue was the NASA/Johnson Space Center (JSC) Gilruth Center Alamo Ballroom. The 2007 Nobel Peace Prize laureate Dr. Bruce McCarl of Texas A&M was the first of two speakers to confirm his acceptance of our invitation. Our event also featured a presentation from Ian Mills of NASA JSC International Space Station (ISS) Robotics Operations. As the event organizer, I started the presentations with a few charts of my own, and all charts from these presentations are now publicly available on the history technical committee web page of our AIAA Houston Section website. [http://www.aiaahouston.org/history_technical_committee/]

A third guest of honor for the evening was Krystal McLane, now Programs Chair of AIAA Houston Section. Her late grandfather, James C. McLane, Jr. (1923-2012, Chair of AIAA Houston Section, 1971-1972), and her late father, James C. McLane III (1945-2015), were both AIAA Associate Fellows and active in AIAA Houston Section. Her grandfather started our Chinese sister section relationship in 1987. AIAA Houston Section technical delegations (with some spouses) visited space centers around China in 1988 and 1992, and a sister section delegation visited us in the NASA/JSC community in 1990. Chris Taylor and then Marlo Graves were later contact people in AIAA Houston Section for this sister section work, with Marlo Graves in that role until 2013, when she moved to Seattle Washington USA. Our sister section is the Shanghai Astronautical Society of the Chinese Society of Astronautics. During his JSC civil servant career, James C. McLane, Jr., led the vacuum chamber testing facility and later the receiving laboratory for lunar materials from the Apollo program. James C. McLane III often wrote for Horizons, newsletter of AIAA Houston Section. From about 2007 to 2014, his writing was featured on almost 60 pages of Horizons, and those pages were collected in a special James C. McLane III memorial issue of Horizons in October of 2015. [For more details, see www.aiaahouston.org/newsletter and www.aiaahouston.org/iac.]

Event details from our publicity

Please join us for the AIAA Houston Section November 2015 dinner meeting, “Climate Change Engineering, Science & Public Policy.” Two presentations will be given, the first by a NASA/JSC robotics engineer (Ian Mills), talking about using SPDM (Special Purpose Dextrous Manipulator) DEXTRE and the International

Space Station (ISS) robotic arm to install climate science instruments such as CATS (Cloud Aerosol Transport System) and RapidScat on ISS. The second presentation will be given by the 2007 Nobel Peace Prize laureate Dr. Bruce McCarl of Texas A&M University in College Station. The Nobel Prize was shared by Al Gore (50%) and the United Nations Intergovernmental Panel on Climate Change (IPCC) for their efforts to build up and disseminate greater knowledge about human-induced climate change, and to lay the foundations for the measures that are needed to counteract such change.

An AIAA Houston Section volunteer [Jesi Hoolihan] is a Tesla employee [Product Specialist]. Given the theme of this event, she suggested that Tesla make a Model S available for inspection after this dinner meeting event:

"Tesla's award winning Model S, now with Autopilot features, is an evolution in automobile engineering. Our advanced electric drivetrain will propel you from 0 to 60 mph in as little as 2.8 seconds, without hesitation and without a drop of gasoline. With the highest safety rating in America and up to 270 miles range, Model S redefines performance driving.

"Experience Model S in Houston at the November AIAA Meeting."

Biography: Bruce A. McCarl, Regents Professor and Distinguished Professor of Agricultural Economics at Texas A&M University. Received B.S. in Business Statistics at the University of Colorado and Ph.D. in Management Science from Pennsylvania State University. My recent research efforts have largely involved policy analysis (mainly in climate change, climate change mitigation, ENSO analysis and Edwards Aquifer water) as well as the proper application of quantitative methods to such analyses. I teach graduate courses in applied mathematical programming and applied risk analysis. Special Focus: Climate Change, Climate Change Mitigation, Water economics, Policy, Mathematical Programming.

Biography: Ian Mills has been a member of the ISS Robotics Operations group since joining NASA in 1996. Mr. Mills has supported both the Space Shuttle and the ISS (International Space Station) robotic operations involving the external robotic systems used for payload deployment and retrieval such as the Hubble Space Telescope, ISS assembly, and on-going ISS payloads and maintenance. Mr. Mills was the lead Robotics Officer for the CATS (Cloud Aerosol Transport System) transfer to ISS, which was launched on the SpaceX CRS-5 mission. Mr. Mills received a BS in Physics and Mathematics from Houston Baptist University.

Above: Climate science instruments and the International Space Station (ISS). Five of them are already installed. RapidScat and CATS (Cloud Aerosol Transport System) were discussed by Ian Mills at our dinner meeting. Three more are planned for installation by 2018, ending with GEDI. Image credit: NASA.

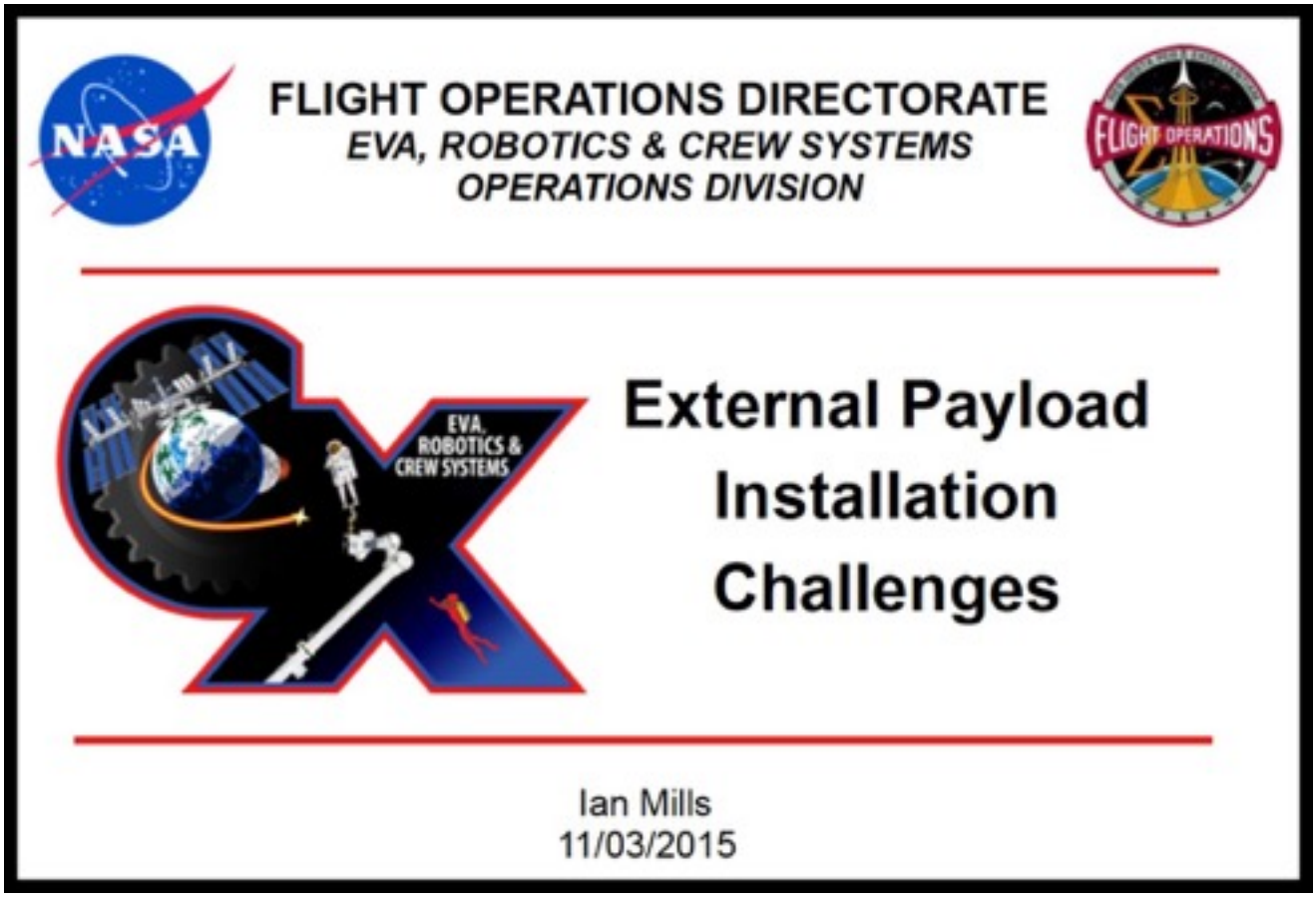
Introduction

Retired NASA/JSC civil servant and AIAA Associate Fellow (and the 1980-1981 AIAA Houston Section Chair) Norman Chaffee started our unofficial event activities by giving a guided tour of the Saturn V rocket at NASA/JSC Rocket Park. Jesi Hoolihan brought the Tesla Model S to Rocket Park at this time, too, at our suggestion, though the principal use of that automobile for the evening was inspection inside and out by our dinner meeting attendees after the dinner meeting. The tour attendees were Dr. McCarl, Krystal McLane (with her 10-year-old son Lachlan), Angela Beck (Honors & Awards Chair, with her 13-year-old son Evan), and me. Mr. Chaffee is often asked by NASA/JSC to give that tour, and it was excellent. A few tourists joined us now and then in our appreciation of Mr. Chaffee's narration. [I learned that the diameter of the first stage of that big rocket is exactly 10 meters because Wernher von Braun was a NASA boss big enough to enforce that requirement. The rest of the Apollo program used English units. In my career, Space Station Freedom started with a truss whose main dimension was exactly 5 meters, but the program quickly changed entirely to English units. Years ago one of our dinner meeting speakers explained that the NASA Orion crew capsule program also struggled with that choice of system of units.]

My charts archive details about this dinner meeting event, list a few cities in the USA using 100% renewable energy (including Georgetown Texas by 2017), and show images of Texas flood damage in Houston and Wimberly (Blanco River) from May of 2015.

Presentation by Ian Mills

I forgot to start my iPhone 5 audio recording of this presentation, but we have his charts on our website, as noted above.

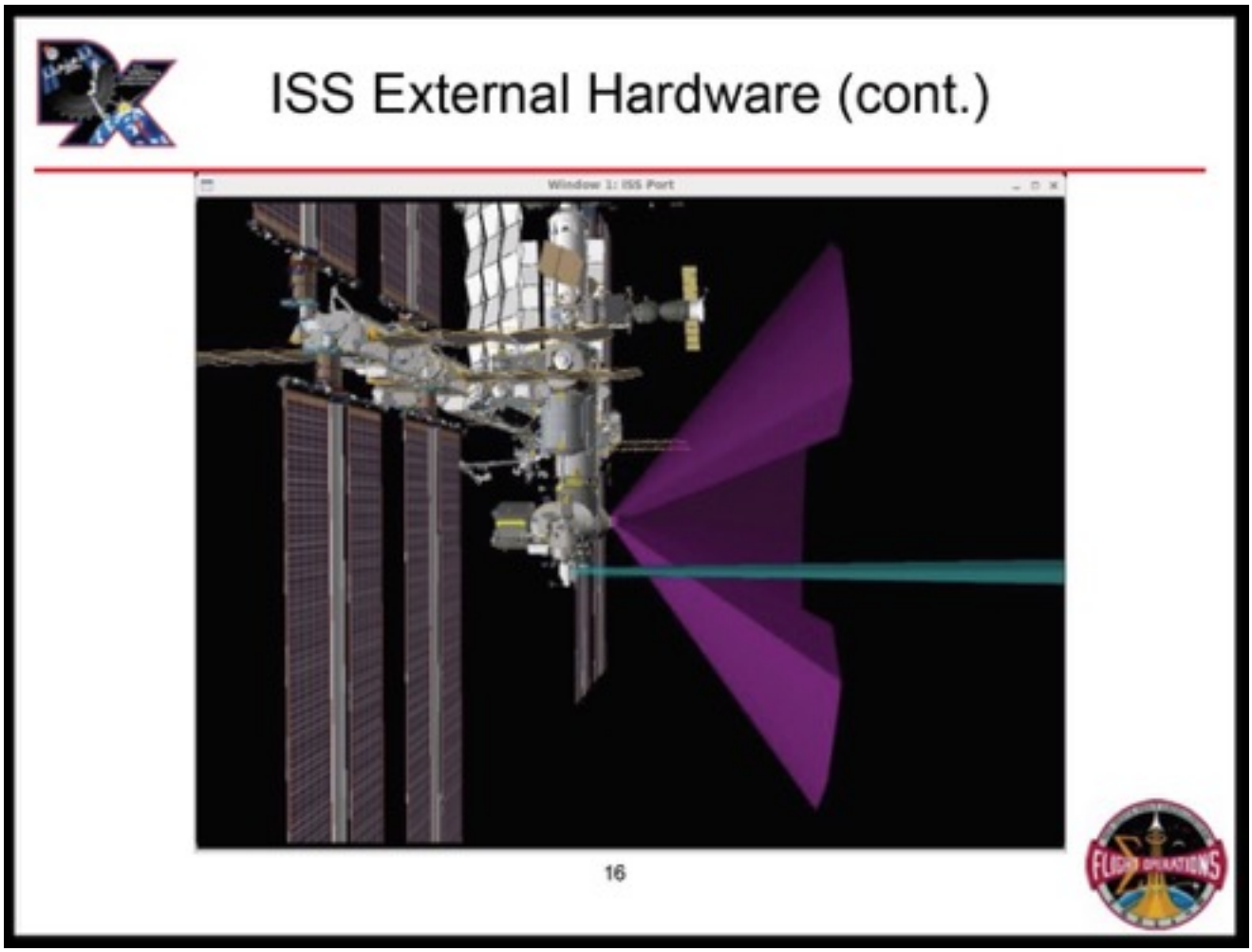


Above: Chart 1 from the Ian Mills presentation. NASA Flight Operations Directorate, EVA, Robotics & Crew Systems, Operations Division, ***External Payload Installation Challenges,*** November 3, 2015. Image credit: Ian Mills, NASA. [As noted on the NASA climate website, climate.nasa.gov, NASA does not promote any particular climate policy.]

The overview lists four challenges;

- Direct Install or Payload Handoff
- Payload Attachment Hardware
- Thermal Constraints
- Trajectory Constraints

The 23 charts discuss both RapidScat and Cloud Aerosol Transport System (CATS) installation on ISS. One additional chart is shown below, apparently presenting field of view visualizations for one or more of these climate science instruments.



Above: Chart 16 from Ian Mills showing visibility issues for a climate science instrument on the International Space Station (ISS). Image credit: Ian Mills, NASA. [As noted on the NASA climate website, climate.nasa.gov, NASA does not promote any particular climate policy.]

Presentation by Dr. Bruce McCarl

I remembered to start my iPhone 5 audio recording using a free, bundled app from Apple, though I missed the first few seconds, but as noted above, charts are publicly available on the history technical committee web page of our AIAA Houston Section website.

The title of his 46-chart presentation is ***Climate Change and Adaption***. The first chart lists Energy, Mitigation, Adaptation and Effects. Chart 2 lists 4 items in the plan for his talk:

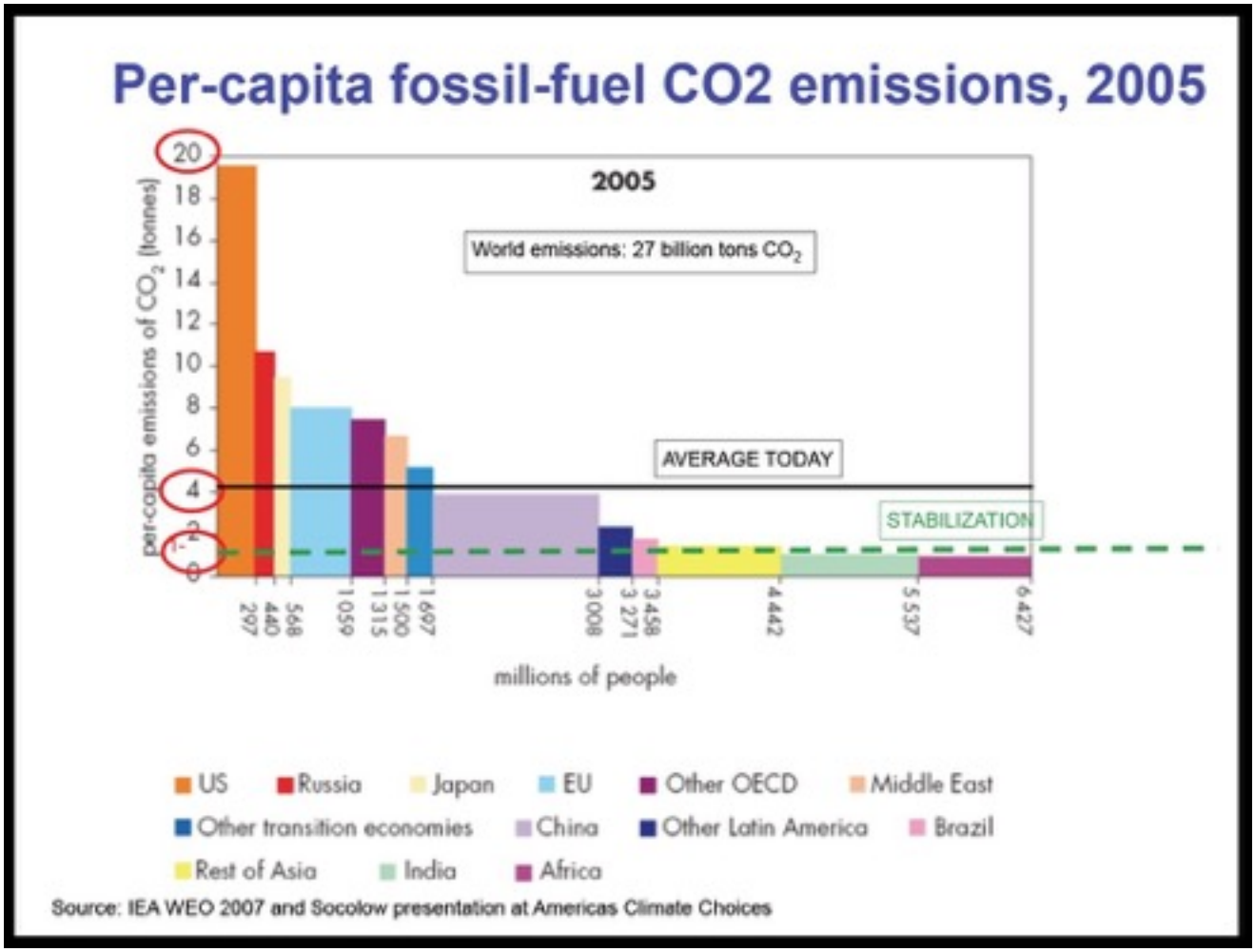
- Some recent climate change evidence
- What is causing this and what are future prospects?
- What about vulnerability and under projections?
- What about adaptation?

The chart 4 title is Climate Change Evidence. The year 2014 was the warmest since records began in 1880. The temperature was 0.69 degrees C (1.24 degrees F) above the 20th century average. [Multiply an increase or decrease by 1.8 to convert from Celsius (or Centrigrade) to Fahrenheit. He notes that 14 or the 15 warmest years in the 135-year record occurred in the 21st century, and 1998 is the other one.

The chart 9 title is Why are we seeing climate change? It lists 4 quotes from the International Panel on Climate Change (IPCC, http://ipcc.ch), dated 1995, 2001, 2007, and 2013.

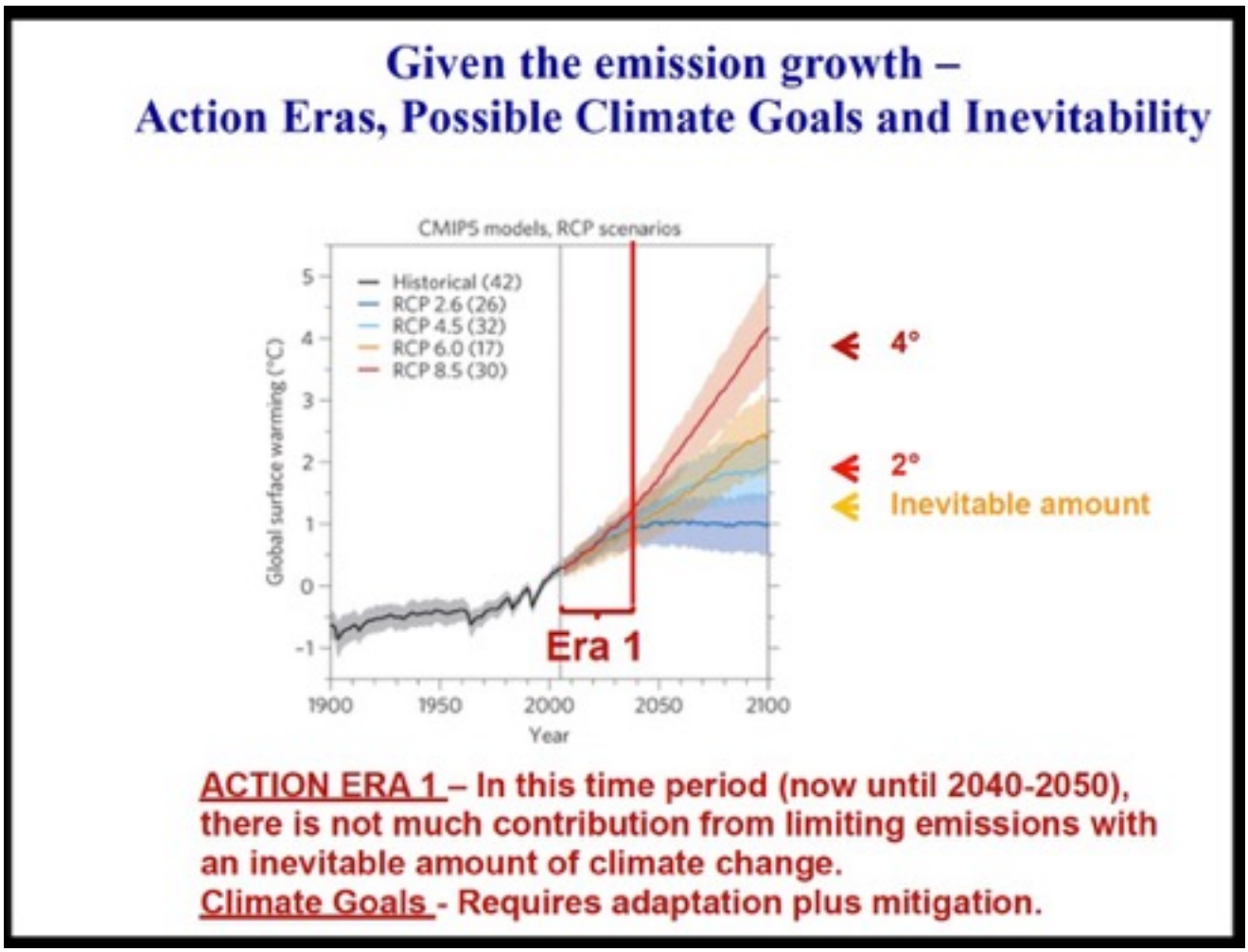
- IPCC (1995) "The balance of evidence suggests a discernible human influence on global climate."
- IPCC (2001) "Most of the warming of the past 50 years is likely (>66%) to be attributable to human activities."
- IPCC (2007) "Most of the observed increase in global average temperatures since the mid-20th century is very likely (>90%) due to the observed increase in anthropogenic (human caused) greenhouse gas concentrations."
- IPCC (2013) It is extremely likely (95–100% probability) that human activities caused more than half of the observed increase in global average surface temperature from 1951 to 2010.

The chart 16 title is Per-capita fossil-fuel emissions, 2005. It is a surprise to me, so it is shown below.



The chart 17 title is "Stabilization": 1 ton CO2/year per capita. This refers to chart 16 above. It is *not* sufficient to limit emissions in the prosperous parts of the world and allow the less fortunate to catch up. The emissions of the future rich must eventually equal the emissions of today's poor, … not the other way around. [Socolow presentation at America's Climate Choices.] As I recall, Dr. McCarl explained that while we meet those requirements for greenhouse gas emissions, rich countries will not plan to lower their standards of living, and the nations of the world will work to create rising standards of living for the poorest countries.

Chart 25 is similar to chart 19 and is presented below.



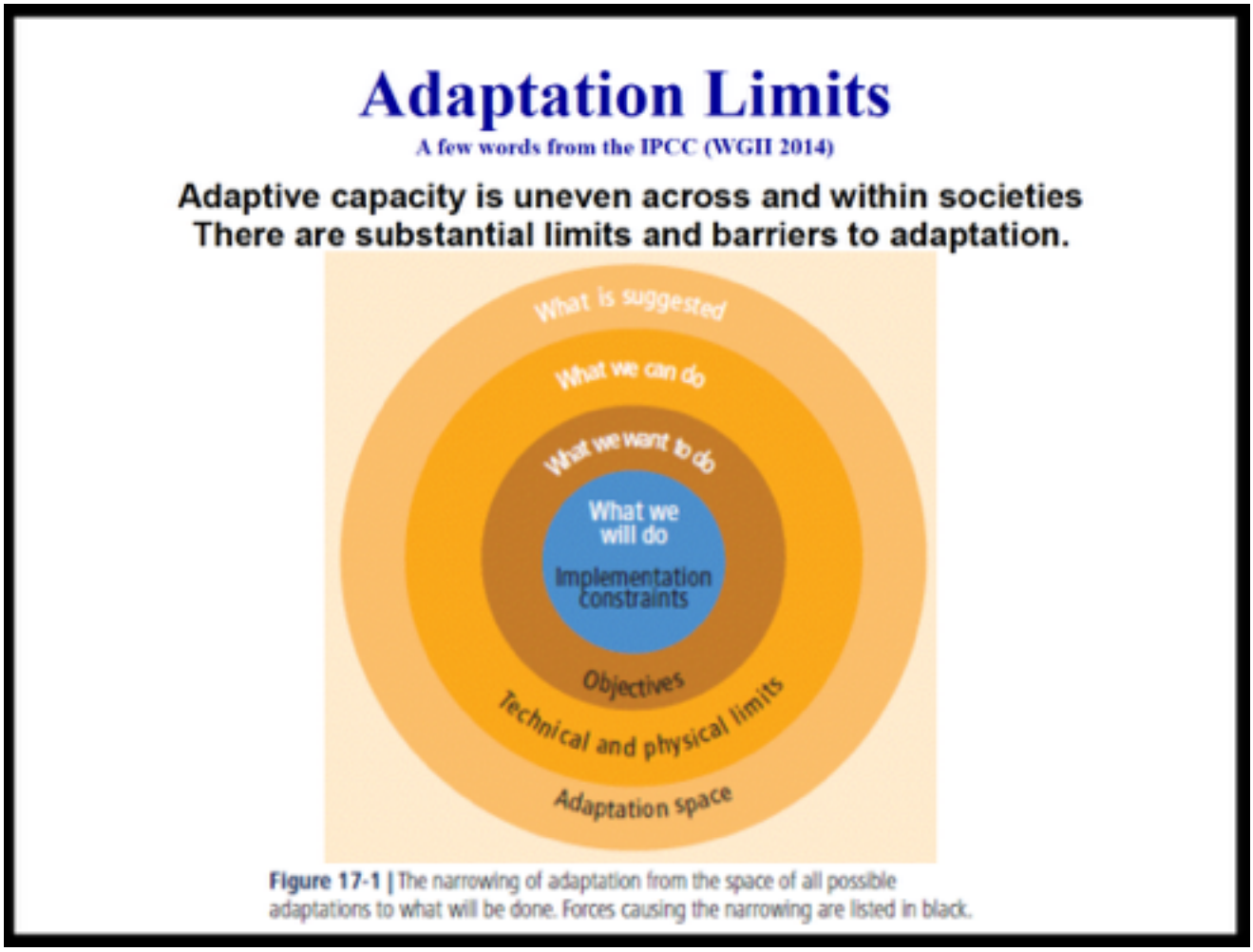
Above: Chart 25. Projections of global average surface temperature increase up to the year 2100.

Looking at chart 25 above, it shows no conflict with the title of the 2013 version of the position statement of the American Geophysical Union (AGU), "Human-induced climate change requires urgent action." That position statement is endorsed by the American Astronomical Society. The AGU position statement has been updated and reaffirmed a few times since its creation in 2003. Mitigation of greenhouse gas emissions is required now, though its effects are small until 2040 -2050 (say 2045). From 2045 to 2100, the effects of mitigation are year 2100 global surface warming of 1.4 C, 2.5C, and 4.1 C, with an uncertainty of about 1 C, using three IPCC scenarios (representative concentration pathways, or RCPs). Dr. McCarl refers to that fourth scenario in the plot (1.0 C by the year 2100) as in the rear-view mirror, or "Disneyland." As I heard elsewhere (Dr. Jeffrey Sachs, Columbia University), even if we magically stop all fossil fuel emissions today, we will still experience an additional increase of 0.6 C, in addition to the 0.8 C increase since about 1750, or the start of the Industrial Age. All 3 of those results (1.4 C, 2.5 C, and 4.1 C) as well as today's result (1.0 C, now more than the 0.8 C increase we often heard about since the start of the Industrial Age) require urgent

action to protect life and civilization. We experience the damage already due to human-induced climate change; the 2011 Texas drought, extreme flooding in Houston twice in 2015, the 2003 heat wave in Europe, and much more.

The title of chart 38 is Ocean Acidification. I will not discuss the subject here except to say that I always mention ocean acidification when talking about climate change.

The title of chart 41 is Adaptation Limits. It is taken from the IPCC report (WGII 2014). It is worth showing below.



Please enjoy the charts from Dr. McCarl on our AIAA Houston Section website as noted above.

Conclusion

The dinner meeting event was very successful thanks to our guests and the many volunteers from AIAA Houston Section. Other helpers include Leslie Glenn and Peggy Wooten working with the Gilruth Center and Jim Molina of Red River BBQ (barbecue). Table linen rentals were from One Stop Tents and Events. Steve Bundrick supplied professional audio and Information Technology (IT) support, thanks to Angela Beck. Jesi Hoolihan accepted my request to take event photographs for us, and this article will be revised as needed to include them in larger-than-thumbnail formats with captions. She also brought the Tesla Model S for our attendees to inspect, and we thank Tesla Motors for that. Given the theme of our event, she suggested to her employers at Tesla that a Tesla Model S be provided in this manner. She recently volunteered to be our AIAA Houston Section Communications Chair. We thank everyone involved, many of whom are not named here.

Climate change was not on my radar until late 2011. Thanks to a late 2012 PBS television show, I understood that I can place a high degree of trust in many sources, while quite a few other sources merit very little trust. As a short summary of a complex subject, I keep in mind the title of the 2013 update to the 2-page AGU position statement, ***"Human-induced climate change requires urgent action."*** That is typical of the science community reporting on this subject to the public policy community and to the rest of the world.