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The curtailment of the shuttle has hindered the ability to transfer crew, leaving the ISS staffed with just three of the anticipated seven astronauts. Because maintaining the station is time-consuming, those astronauts can devote to research only about a quarter of the time originally allotted for science. The European portion of that time is smaller still — with Columbus in place, astronauts will have between 15 and 20 hours every six months to devote to European experiments, Zell says. That means some time-intensive studies of biology and human physiology will have to wait until 2009, when the station's crew is scheduled to double to six.

Just a year later, Columbus's scientific schedule will face another setback: NASA's retirement of the space shuttle. Without the shuttle, there will be no good way to return samples to Earth, says Julie Robinson, NASA's ISS programme scientist at the Johnson Space Center in Houston, Texas. Russia's Soyuz capsule, which will temporarily replace the shuttle, can hold just 50 kilograms of extra weight on its way home. Biological samples in particular, which can require bulky refrigeration, are likely to mount up at the station unless another return method can be developed, she says. "It's going to be a huge problem."

Heppener says that ESA is now "working hard" on technologies that will allow astronauts to do more of the required analyses at the station. Robinson adds that new commercially developed vehicles might allow for more samples to be sent home.

The setbacks will only increase the long-standing scepticism of space-station science held by some researchers. Studies of human physiology in space are useful only if governments are willing to pursue costly programmes of exploration beyond Earth orbit, says Paul Murdin at the Institute of Astronomy in Cambridge, UK. Other microgravity experiments are only of "specialized interest", he adds. "The money being spent could be better used for something else."

But others maintain that there are some fundamentally interesting experiments that could be done. For example, a weightless environment could help physicists to study Bose-Einstein condensates, clumps of ultracold atoms that act identically. It could also be used to improve atomic-laser experiments and the accuracy of atomic clocks, according to Günther Hasinger of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany. "Now that the infrastructure is there," he says, "we'd better use it in the best possible way." ■

Geoff Brumfiel

UN talks only one part of the negotiations needed on climate

As delegations from around the world converge this week on Bali, Indonesia, for the latest round of United Nations (UN) climate talks, one thing is increasingly clear: although the UN Framework Convention on Climate Change is indisputably the main venue for such talks, it is by no means the only one. Nor should it be, many experts say.

For instance, last week French President Nicolas Sarkozy led a delegation visit to China at which key topics included energy and global warming, and the French nuclear giant Areva walked away with a deal for two nuclear power plants and the possibility of many more in the world's fastest-growing economy.

And a week before that, more than a dozen Asian nations, including India and China, signed an agreement to push for clean energy and tackle global warming. There are also coalitions aimed at urging the international community to include tropical-forest protection in whatever treaty succeeds the Kyoto Protocol. And global warming has been a primary focus of at least three international meetings this year — those of the G8 industrialized countries, the UN and, for the first time, a meeting under the auspices of US President George W. Bush in Washington DC.

"I'm actually not so worried about the treaty negotiations. I think it's much more important to get a small number of countries around a table and work out a game plan in each individual case," says David Victor, who heads Stanford University's Program on Energy and Sustainable Development.

The goal heading into Bali is not to negotiate the treaty itself but to settle on a roadmap for negotiations, with a likely end date of 2009. From this perspective, there simply won't be enough time to work out all of the details at UN meetings. In fact, once the roadmap is set, much of the work on any proposals made could be formulated well in advance of the meetings themselves.

"There's pretty broad agreement that the Framework Convention is the place to cut the grand deal, but that will only happen once the major players reach a stronger consensus," says Elliot Diringer, director of international strategies at the Pew Center on Global Climate Change in Arlington, Virginia. "Bilateral contact and other initiatives outside the UN process are key to reaching that consensus," he adds, as long as everyone keeps their eye on achieving a global treaty.

Many advocacy groups bristled when the Bush administration held its meeting of "major emitters" in September, fearing that it was intended to undercut the UN negotiations.

Rob Stavins, an environmental economist at Harvard University, acknowledges there is room for scepticism towards Bush, who has dragged his feet in the international negotiations for years. But bringing nations such as China, India and Brazil to the table with the industrial nations makes sense, he says. "It's questionable whether there was much that was meaningful in that meeting, but it was the right set of parties around the table."

The developing nations know that their bargaining power stems from fears among Western nations that their own actions to curb greenhouse gases will mean little unless everyone participates. There is also growing scepticism about the "clean development mechanism", the Kyoto Protocol's main vehicle for carbon-reducing technology transfer to developing



E. FEFERBERG/POOL/AP

Presidential duo: China's Hu Jintao (left) and France's Nicolas Sarkozy met to discuss climate change.

nations. Victor says crafting alternative incentives for nations such as China might prove intractable without a forum that is "smaller and a lot more flexible" than the UN process.

"My guess is that the Chinese are going to be a whole lot more comfortable in bilateral and multilateral negotiations than under the klieg lights of the UN process," he says. "Those kinds of discussions aren't antithetical to Kyoto — they are just more important. Big treaties almost always follow such negotiations rather than lead them."

John Ashton, a UK climate-change envoy, says debate about venue and process misses the point. Global warming should top every agenda as nations meet in the coming years, but the only venue for resolving the issue is the UN. "An international treaty is an expression of political will," he says. "It's not about the precise architecture of the treaty. There are lots of available policies, and we understand them quite well — it's the urgency and amplitude with which we apply those policies that's important." ■

Jeff Tollefson