**TTL workshop and CAST site visits by Neil Harris and Geraint Vaughan – October 2012**

**1. US-Japan TTL Workshop**

This workshop had two aims: (i) bringing together US and Japanese scientists interested in TTL studies; (ii) tutorial material for the large number of young scientists present; and (iii) promoting cooperation between the various field measurement activities planned for 2013-15, some funded, some not. It was a very good workshop with many high calibre scientists present. The presentations are available on <http://scholar.valpo.edu/ttlworkshop>, and are worth looking at.

The main theme of the science was water vapour, i.e how the TTL controls the stratospheric water vapour and cirrus. This was probably not deliberate and was interesting given the main joint interest of CAST, ATTREX and CONTRAST is transport as deduced from tracers with different lifetime.

There are a number of proposed and funded activities taking place in the 2013-15 period listed below. Within this, there is a significant focus on Jan-Feb 2014.

***Projects in 2013-15 (Italics indicate proposals)***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Project** | **Activities** | **2013W** | **2013S** | **2014W** | **2014S** | **2015W** | **2015S** |
| CAST | BAe-146, sondes |  |  |   |  |  |  |
| ATTREX | Global Hawk |  |  |  |  |  |  |
| *CONTRAST* | NCAR GV |  |  |  |  |  |  |
| *SOWER* | Sondes |  |  |  |  |  |  |
| *BATTREX* | Sondes |  |  |  |  |  |  |
| JAMSTEC | Sondes |  |  |  |  |  |  |
| *\*SEAC4RS* | *GV?, ER2, DC8* |  |  |  |  |  |  |
| *StratoClim* | *M55, HALO?* |  |  |  |  |  |  |
| On-going | SHADOZ, NOAA H2O |  |  |  |  |  |  |

*\* SEAC4RS is funded, but the plans are currently being reformulated after the cancellation in Thailand.*

***Jan/Feb 2014 projects***

|  |  |  |  |
| --- | --- | --- | --- |
| **Project** | **Funded?** | **Comment** | **PI** |
| CAST | Yes | BAe-146 in Guam; sondes in Chuuk / Palau | Harris |
| ATTREX | Yes | Global Hawk in Guam (tbc); certainly in W. Pacific | Jensen |
| CONTRAST | Likely | NCAR GV in Guam | Pan, Atlas |
| SOWER | Proposal | Sondes in Tarawa, Biak, Kototabang, Hanoi | Hasebe |
| BATTREX | Proposal | Sondes in Manus | Morris |

In addition to research scientists, we met Bill Ward, the Pacific Environmental Scientific and Services Division Chief for NWS, who includes the Guam, Chuuk and other West Pacific stations under his remit. He was very enthusiastic to make sure that the measurements they make are used to the full, and as a result of this workshop is working on saving all the high time resolution radiosonde data (currently deleted after 3 months). He is happy to support our research activities and is working with GV on an MoU.

The scientific advantages of using Palau as a base for the CAST sondes and for a southerly stepping stone for CAST BAe-146 flights became apparent during the workshop. It was too late to arrange a visit on this trip, but this will need careful examination. The main reasons are that it is deeper into the region of mass upwelling at 800 hPa; it is more in the region of near-zero ozone observation; and it has good infrastructure. JAMSTEC have a programme there which involves a radar, periods of intensive radiosondes and ozonesondes. Markus Rex AWI is interested in supplementing and continuing the programme after CAST.

Unfortunately, the Japanese PI (Junko Suzuki) was not at the workshop and so it is not clear how keen she is on cooperation. The JAMSTEC sonde programme seems to be centred on northern summer, so it is not obvious there is a real clash. However there is already a lot Japanese TTL research in the Pacific and it is clear that there are sensitivities that will need careful handling.

***Wider campaign issues***

a) Since there is so much uncertainty surrounding funding of SOWER, BATTREX and STRATOCLIM, it is likely that plans will change substantially between now and 2014. It is not impossible, for example, that we may end up operating from both Palau and Chuuk for example with US colleagues operating one of the sites.

b) The issue arose of access to ECMWF forecast products for the campaign. Karen Rosenlof undertook to contact Andreas Dornbracht to see if we could have access to his products. We will pursue this as well, building on our visit to ECMWF earlier in the year. To this end a Trajectory group, comprising Rennie Selkirk, Niski, Fujiwara, Neil and Geraint was set up.

c) NASA have a Google-Earth based mission support tool which allows the aircraft track to be superimposed on a wide range of products (e.g. satellite, radar, model) in real-time. It is web based and can ingest information from non-NASA aircraft. We need to get Axel Wellpott talking to NASA about transmitting FAAM’s position to them in real time. The tool users layers like Google Earth and can ingest kml or png files. Further information on ATTREX is available from <http://espo.nasa.gov/missions/attrex> and <http://espoarchive.nasa.gov>

d) There was also talk of setting up a wiki for the range of projects coming up in the W Pacific.

**2. Chuuk**

Chuuk is the largest, but poorest island in the Federated States of Micronesia. It has a three or 4 tourist standard hotels which rely to a large degree on visits from scuba divers who have come for the 2nd World War wrecks. Though poor, petty crime is low. It is fine for overnight stays for BAe-146 personnel and associated scientists. People launching ozonesondes, etc would probably want to rotate in and out a bit. It is safe – there are just limited options for people staying there. The NWS station has space for our sonde and ground-based activities and an interested group of personnel. The station manager, Joe Berdon, was personally impressive and has a good reputation in NWS regionally.

***Chuuk airport***

NH and GV met Kane Faylim, airport manager of Chuuk airport on 23rd October 2012. Joe Berdon (NWS manager at Chuuk) was with us. The discussion was very constructive and positive. The main issues (not in order) were:

1. The runway length is 6600’. There are regular flights of Boeing 737, so there should be no operational problems with the BAe-146.
2. There is no hangar. The 146 will have to be outside over night, probably on the pan in front of the terminal building.
3. A 90 kVA ground power unit and a/c unit will have to be shipped to Chuuk ahead of time.
4. The airport charges are currently $0.85 per 1000 lbs and $100 per night aircraft storage. Joe Berdon and Kane Faylim will write to the FSM government to see if the fees can be waived in view of the works’ value to the country.
5. To assist this, NH should write a half page description of the CAST activities in Chuuk.
6. There is one scheduled flight per day in Chuuk. In addition, there are occasional visits from private aircraft and a small inter-island operator.
7. The airport is open from 0800-1700 Mon-Sat and from 1900 to 0300 on Sunday (chk).
8. The FSM government should be given ~ 1 week’s notice of flights of the BAe-146 into Chuuk in order for immigration and aviation services to be commissioned.
9. Access and security were discussed, and there was a lot of good will to come up with a system which works for everyone. We did not go into details such as access to the plane before the airport opens.
10. The High Tide hotel is just a few minutes walk from the airport.
11. Kane Faylim is the point of contact for the airport and will make sure that any enquiries go to the right person.

***Chuuk National Weather Service***

GV and NH met Joe Berdon (station chief) and the team at the NWS station on Chuuk. It is located next to the airport and there is a strong relationship between Joe Berdon and Kane Faylim. Both are locals. Joe Berdon is an impressive individual with a good reputation in NWS. They are not currently using Vaisala RS-92s which surprised Bill Ward.

**3. Guam**

Guam is a good place to base the aircraft. It is well served by commercial flights from Asia and the US. There is a range of hotels including some, we think, which allow a degree of self-catering and so probably attractive to the scientific teams. There were a number of hire car companies. The people we met were friendly and helpful. The earlier NASA site visit had showed that speciality gases are available.

***Anderson Air Force Base***

GV and NH met Lt Col Blane Kilpper, head of operations of the Global Hawk squadron at AAFB. Once we got on base, he showed us the change of slope in the runway which is causing concerns for the ATTREX team. And we can see why - it is a very obvious feature. We then had a good discussion where we explored the possible constraints that would be imposed on CAST if it operated on AAFB. The main points are:

1. Decisions about our (or ATTREX’s) presence will not be made by the Global Hawk squadron who are guests of the 35th Wing which is responsible for the base.
2. The probable way to achieve this is for a high level approach to be made by NASA on behalf of ATTREX and CAST which, if approved, would make things possible at AAFB.
3. For now, informal enquiries can be made to identify any show-stoppers or particular sensitivities. We all agreed that it would not work if we were there but were not welcome.
4. Initial phone calls showed that there is a process to ask for security clearance ahead of time followed by the issue of access permits for US and foreign nationals. Such permits should mean that access can be given without escorts.
5. All requests for hangar space, general space, ground equipment, fuel, etc would have to go through the Logistics corps. No-one was available while we were there, but Lt Col Kilpper will follow up on that.
6. No major restriction on flights, take-offs and landings was anticipated.
7. Lt Col Kilpper will continue to make exploratory enquiries and will get back to us about this. He and Lt Col Simmons should remain the main contacts.
8. Lt Col Kilpper was very helpful and is happy to do this. He is clear however that any decisions will be made by other people in the USAF and he implied that the Global Hawk squadron cannot do much to influence that.
9. The main issue is securing approval for our activities and then making the appropriate arrangements. Cost was not mentioned.

***Guam civilian airport***

GV and NH met Gerard Bautista, the air terminal manager (chk). He was very friendly and approachable, and he was enthusiastic about the BAe-146 being based at Guam airport.

1. Boeing had conducted tests with the Dreamliner aircraft there a couple of years ago. This involved about 60 technical people working with the aircraft. This had gone well.
2. The infrastructure at the airport is good. Access to it is though one of the ground-handling companies rather than the airport administration. These companies could provide hangar and office space (though a sub-lease from an operator), ground handling units.
3. They would even be involved in security either through administration of security passes or through provision of an escort service (the right kind!).
4. The south side of the airport, away from the main terminal and commercial operations, would be a good location for CAST and/or CONTRAST aircraft. It is reasonably self-contained and is next to the NWS offices which might mean easy access to their facilities.
5. He will send the relevant paperwork which will be passed on to FAAM/DFS.
6. The main issue, presumably, is cost.

***Guam NWS***

GV and NH met Genevieve Miller (meteorologist in charge), Roger Edson (extreme weather?) and Chip Guard (Warning Coordination meteorologist) who were an impressive trio. Informal consultation during the campaign should be easy. Formal forecasting is possible, but would need some organisation /resources. If that is requested, a joint request should be made from CAST, ATTREX and CONTRAST. We did not look around the offices to see if any space might be available, but that might be an issue if the BAe-146 is based on that side of the airport.

***Univ. Guam***

Prof Mark Lander, a meteorologist at the University of Guam, was ill the day we had hoped to meet him. The possibility of collaboration will continue to be discussed.