Could we make rain through lasers?

By Hannah Price,
Written after the visit of Mr. Kasparian to the IRHA office in Geneva

On the 18th May, the IRHA team had the privilege to meet with Jérôme Kasparian, an optical physicist and a senior researcher at the University of Geneva, the University of Lyon and at the CNRS (French National Centre for Scientific Research), who is developing the use of lasers to produce rain. Kasparian and his colleagues are researching into laser technology that could be used in the future to encourage condensation in the atmosphere, leading to precipitation. It was an extremely informative meeting and we are keen to follow this innovative technology and its potential future uses.

This pioneering method is still in the very early stages and is a long way off from producing rain in the atmosphere, but early indications from experiments have given encouraging results.

For rain (or any other precipitation) to form in the atmosphere, two conditions are required; humidity and a surface. The air may have a very high humidity percentage, but without condensation nuclei, the water vapour will not be able to condense and form water droplets. Condensation nuclei occur naturally in the atmosphere in several forms including dust, pollen, salt (in marine environments) and sand; cosmic rays from the sun can cause the ionisation of particles that can also lead to condensation.

It is often the lack of a surface that prevents water vapour from condensing and forming water droplets, and consequently rain. This is where the laser comes in.

The laser aims to imitate the cosmic rays, by ionising the air to promote condensation. The laser sends out short pulses of high power that ionises the molecules in the atmosphere, these ionised molecules then act as condensation nuclei.

Early experiments in the lab indicate that condensation occurs within the laser and droplets form. Though initially tried at 200% humidity, which would not occur naturally in the atmosphere, they found that condensation will occur as low as 70% humidity.

The first trial outside the lab took place in Berlin. The beam was fired into the sky along with a second laser to illuminate the particles, so they could remotely observe the results. Formation of condensation nuclei was seen at 50-100m above the ground as the second beam encountered an increased number of particles. However, due to the wind in the atmosphere, the particles moved away from the detection laser, so they were unable to observe how the particles grew. This meant they could not detect any big water drops, though as they could observe condensation nuclei, it can be assumed that condensation followed.

Silver iodide is already used to help produce rain and has been highly publicised in the past, but is itself controversial. It carries with it several problems including what happens to the silver particles, which could be poisonous and cause environmental

problems, once they reach the ground. It is also extremely expensive, limiting to only a few circumstances where it is economically advantageous.

In the future, using lasers means there will be no waste products, and while initially the start up costs for the technology will be expensive, the long-term running costs should be much less than using silver iodide.

Laser technology is still in its very early days, and is unlikely to produce rain for many more years. Large amounts of research and development are still required. However, it gives encouragement that in the future we may be able to produce rain in an environmentally friendly way, and the more rain there is, the more rain can be harvested. It will then be up to us to develop even better ways of capturing this precious resource.