

Introduction

In the OPAL Climate Survey we aim to study aspects of the way human activities affect climate, and the way in which climate change may affect us. The activities in this Workbook involve us measuring the weather. But what is the difference between weather and climate? Weather is the condition of the atmosphere at any particular time: temperature or rainfall, for example. Climate is an average of weather conditions (usually for a given month) over a 30 year period, including its variability and extremes.



Activity 1 **Are aircraft making clouds?**

What are contrails?

Contrails are the tracks that high-flying planes leave behind in the sky. Activity 1 asks you to look for these and report what type you see.

How do they form?

When we breathe out on a cold day, the water vapour in our breath mixes with cold air and condenses into a mini cloud of water droplets – we say we can ‘see our breath’. In the same way, when fuel is burnt in an aircraft’s engine, the water vapour which is formed mixes with the very cold air at high altitudes and condenses. The air is so cold that **ice crystals** are formed. The line of ice crystals left behind is called a condensation trail or ‘**contrail**’.



How cold does it need to be?

The temperature needs to be below about -40°C for a contrail to form, so aircraft have to be above about 10km (about 30 000ft), the altitude at which most airliners cruise. If the atmosphere is fairly ‘dry’ (has a low relative humidity, meaning it contains little water vapour) then no contrail will form, or if it does form it will evaporate quickly and disappear. If the atmosphere is ‘moist’ (has a high relative humidity, having lots of water vapour) then contrails can last for a long time, and even spread out.

Why do contrails matter?

High clouds stop some invisible infrared (heat) radiation leaving the earth, in the same way as greenhouse gases do. They have a warming effect on climate. Spreading contrails act in the same way. Their warming effect is very uncertain, although much less than that from man-made carbon dioxide.

Can contrails be seen everywhere?

Aircraft use different routes in the sky and so contrails may be very common in some places, and quite rare in others – reporting ‘no contrails’ is a useful result.





Activity 1 Are aircraft making clouds?

Results for Activity 1

Please do this short activity any time of the day on as many days as possible. Decide on what type of contrail (if any) you can see. You can report **O** (for overcast), **A**, **B**, **C** or **D**.



O Overcast



A No contrails



B Short-lived contrails – disappearing soon after they are formed



C Long contrails stretching out across most of the sky, but not spreading much



D Long-lived contrails spreading out to form cirrus-like clouds

Report your observation by using the form or going online.

- ~~To report online, go to www.OPALexplorenature.org/contrails and just follow the steps shown.~~
- Using the **form** below, please record the time and date, then the first part of the postcode where you are observing from, and finally the contrail type(s). At the end of the survey, post the form to the address at the bottom. If you run out of space, please make photocopies, or just make up your own form.

Time	Date		First part of postcode	Contrail type(s)
	day	month		
0930	03	04	GU42	O
1430	23	05	SW1	B C

Time	Date		First part of postcode	Contrail type(s)
	day	month		

~~Post the completed recording sheets to: **Freepost RSCH CKYJ HYYG, OPAL, Centre for Environmental Policy, Imperial College London, London SW7 2AZ**~~



~~If you can take a photograph of the sky and any contrails while you are doing the activity, please send it to us at climate@OPALexplorenature.org with a note of what contrail type you recorded it as (i.e. A, B, C or D). Selected photographs will be used on the website.~~

