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1 **Artificial cloud test confirms volcanic ash detection using** 2 **infrared spectral imaging—Supplementary material**

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18 **Supplementary Material**

19 Movie files from all four runs are available as supplementary materials. All videos were created
20 using a custom Python script that reads the FITS files and generates a JPEG image at ~ 1 Hz fre-
21 quency. The images are then passed on to an open source tool called ffmpeg that encodes them in
22 the mp4 format. These were converted to mov format files using Apple Quicktime. All processed
23 data are available as digital data in FITS file format with calibrated brightness temperatures, instru-
24 ment parameters, aircraft attitude information, GPS location and camera instrument data. These
25 data can be requested from David Moriano through email at dm@nicarnicaaviation.com.

26

27 **Ash Tanker Test 30 October 2013 - Run 1 FL150.mp4** AVOID dual band imagery showing
28 broadband temperatures (Kelvins; white=warm, blue=cold) of the sky ahead of the A340. Time
29 resolution is approximately 1 s. FL150=flight altitude of 15,000 ft. No ash signal (indicated in
30 shades of yellow/orange/red) was detected on this run.

31

32 **Ash Tanker Test 30 October 2013 - Run 2 FL100.mp4** AVOID dual band imagery showing
33 broadband temperatures (Kelvins; white=warm, blue=cold) of the sky ahead of the A340. Time
34 resolution is approximately 1 s. FL150=flight altitude of 10,000 ft. A seconds of data (10:38:51-
35 10:38:53Z) indicated an ash signal at the extremity of the camera's field of view.

36

37 **Ash Tanker Test 30 October 2013 - Run 3 FL050.mp4** AVOID dual band imagery showing
38 broadband temperatures (Kelvins; white=warm, blue=cold) of the sky ahead of the A340. Time

39 resolution is approximately 1 s. FL050=flight altitude of 5,000 ft. A noisy ash signal is first ob-
40 served at 10:54:23Z, when the A340 was approximately 68 km from the ash layer. The ash signal
41 becomes increasingly coherent as the aircraft approaches, and a steady signal is observed from 50
42 km. Note that the circular, white coloured (warm) feature moving across the image is the DA42
43 aircraft.

44

45 **Ash Tanker Test 30 October 2013 - Run 4 FL050.mp4** AVOID dual band imagery showing
46 broadband temperatures (Kelvins; white=warm, blue=cold) of the sky ahead of the A340. Time
47 resolution is approximately 1s. FL050=flight altitude of 5,000 ft. A repeat run at 5,000 ft also
48 showing coherent detection from distances of ~50 km.

49

50 **Ash Tanker Test 30 October 2013 - DA42.mp4** AVOID dual band imagery showing broadband
51 temperatures (Kelvins; white=warm, blue=cold) of the sky ahead of the A340 for run 4, with ash
52 mass loadings overlaid and collocated with the position of the DA42. The circles indicate positions
53 where mass concentrations were measured by the OPCs and their size is proportional to the mass
54 concentration.