Eitan Hirsch

> Head of the Environmental Sciences Division
> Israel Institute for Biological Research (IIBR)

SUMMARY STATEMENT

Atmospheric Sciences researcher, with special emphasis in remote sensing of the atmosphere.

- Cloud microphysics and cloud-aerosol interactions.
- Radiative properties of clouds and aerosols.
- Remote sensing of clouds, aerosols and gaseous plumes. Experience in the UV-VIS-NIR-SWIR-LWIR regime. Specifically, development of novel retrieval methods for:
    - Cloud base height
    - Optical and microphysical properties of thin warm clouds.
    - Detection, identification and quantification of atmospheric pollutants
- Highly experienced with operation and analysis of wide variety of broadband, multi and hyperspectral sensors, in the spectral regimes of UV-VIS-NIR-SWIR-LWIR.
- Development of image processing and spectral analysis algorithms.
- Development of spectral signatures models and simulations.
- Highly experienced in conducting ground-based field campaigns to measure atmospheric parameters and validation of retrieval methods.
- Highly experienced in leading a scientific research group.
- Management skills (research group, department, division).

EDUCATION

2014

Department of Earth and Planetary Sciences,
Weizmann Institute of Science, Israel

PhD

- Thesis title: Studying small, warm clouds using theoretical models and ground based spectral-spatial-temporal observations.
- Supervisors: Prof. Ilan Koren, Dr. Eyal Agassi

2007

Electro-Optics and Photonics Unit, Faculty of Engineering,
Ben-Gurion University of the Negev, Israel

M.Sc.

- Thesis title: Comparing statistical and spatial characteristics of urban and rural infrared images.
- Supervisor: Prof. Nathan Kopeika

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2002

Faculty of Science,

The Hebrew University of Jerusalem, Israel

B.Sc.

> Bachelor degree in Physics and Computer Sciences.

EMPLYOMENT HISTORY

2017-Present

Israel Institute for Biological Research (IIBR)

Head of the Environmental Sciences Division

2016-2017

Israel Institute for Biological Research (IIBR)

Head of the Environmental Physics Department

2015-2016

Israel Institute for Biological Research (IIBR)

Researcher at the Environmental Physics Department

2002-2014

Israel Institute for Biological Research (IIBR)

Research assistant at the Environmental Physics Department

PEER-REVIEW PUBLICATIONS

1. E. Hirsch and E. Agassi, "Detection of Gaseous Plumes in IR Hyperspectral Images Using Hierarchical Clustering", *Appl. Opt.* **46**, 6368-6374 2007.
2. E. Hirsch, E. Agassi, N. S. Kopeika, “Comparing Statistical and Spatial Characteristics of Urban and Rural Infrared Images (I) – Data Analysis”, *Optical Engineering*. **47**, 046401 2008.
3. E. Hirsch, E. Agassi, N. S. Kopeika, “Comparing Statistical and Spatial Characteristics of Urban and Rural Infrared Images (II) – Background Simulation”, *Optical Engineering*, **47**, 046402 2008.
4. E. Hirsch and E. Agassi, "Detection of Gaseous Plumes in IR Hyperspectral Images – performance analysis", *IEEE sensors*, **10**, 3, 732-736, 2010.
5. E. Hirsch, E. Agassi, I. Koren, "A novel technique for extracting clouds base height using ground based imaging", *Atmos. Meas. Tech*., **4**, 117-130, 2011.
6. E. Hirsch, E. Agassi, I. Koren, "Determination of optical and microphysical properties of thin warm clouds using ground based hyper-spectral analysis", *Atmos. Meas. Tech*., **5**, 851-871, 2012.

7. O. Altaratz, I. Koren, L. A. Remer, E. Hirsch, "Review: Cloud invigoration by aerosols—Coupling between microphysics and dynamics", Atmospheric Research, 140–141, 38-60, 2014.
8. E. Hirsch, I. Koren, Z. Levin, O. Altaratz, E. Agassi, "On transition zone clouds", Atmos. Chem. Phys., 14, 9001-9012, doi: 10.5195/acp-14-9001-2014, 2014.
9. E. Hirsch, I. Koren, O. Altaratz, E. Agassi, "On the properties and radiative effects of small convective clouds during the eastern Mediterranean summer", Environmental Research Letters, 10.4 (2015): 044006
10. E. Hirsch, I. Koren, O. Altaratz, Z. Levin, E. Agassi, "Enhanced humidity pockets originating in the mid boundary layer as a mechanism of cloud formation below the lifting condensation level", Environmental Research Letters, 12.2 (2017): 024020
11. Z. Klausner, E. Fattal, E. Hirsch, S. C. Shapira, "A single holiday was the turning point of the COVID-19 policy of Israel", Int. J. of Infectious Diseases, Vol. 101, 368-373, 2020
12. E. Hirsch, E. Agassi, A. Manor, "Using longwave IR hyperspectral imaging for a quantitative atmospheric tracer monitoring in outdoor environments", Int. J. of Geosciences, 12, 233-252, 2021.
13. E. Hirsch, I. Koren, "Record breaking aerosol levels explained by smoke injection into the stratosphere", **Science**, 371, 1269-1274, 2021.
14. O. Altaratz, I. Koren, E. Agassi, E. Hirsch, Y. Levi, N. Stav, "The environmental conditions behind the formation of small (subLCL) clouds, Geo. Res. Lett. 2021, 48(23), e2021GL096242

CONFERECES PAPERS

1. E. Agassi, E. Hirsch, "Remote detection of SF_6 plumes in a stable boundary layer", *Proceedings of the SPIE*, **5988**, 59880G, 2005.
2. E. Agassi, A. Ronen, N. Shiloah, E. Hirsch, "Discrimination between natural dense dust clouds with IR spectral measurements", *International Journal of High Speed Electronics and Systems*, **18**, 647-660, 2008.
3. E. Agassi, E. Hirsch and A. Ronen, "Spectral and Spatial measurements of atmospheric aerosol clouds with a hyperspectral sensor", Proc. SPIE 7835, Electro-Optical Remote Sensing, Photonic Technologies and Applications IV, 78350I, 2010.
4. Agassi, E., Hirsch, E., Chamberland, M., Gagnon, M. A., & Eichstaedt, H. Detection of gaseous plumes in airborne hyperspectral imagery. Chemical,

Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XVII (vol. 9824, p. 98240U). International Society for Optics and Photonics, 2016.

CONFERECES LECTURES

1. E. Hirsch, E. Agassi: Detection of gaseous plume in IR hyperspectral images using spatial modified K-means, The 11th Meeting on Optical Engineering and Science in Israel (OASIS), Tel Aviv, Israel, 2007.
2. E. Hirsch, E. Agassi: Detection of Gaseous Plumes in IR Hyperspectral Images Using Hierarchical Clustering, TELOPS Scientific Workshop: Working with IR Hyperspectral Imagers, Washington D.C, U.S.A, 2007.
3. E. Agassi, E. Hirsch, Monitoring of SO_2 emissions from stacks using multispectral imaging in the UV and visible spectral bands, *Proceedings of 6th EARSeL Imaging Spectroscopy SIG Workshop*, Tel Aviv, 2009.
4. E. Hirsch, E. Agassi, I. Koren: Determination of optical and microphysical properties of thin warm clouds using ground based hyper-spectral analysis, *Gordon Research Conference on Radiation & Climate, Clouds, Aerosols, Precipitation and their Role in Climate Change,* Colby College, Waterville, ME, USA, 2011
5. E. Hirsch, E. Agassi, I. Koren: Retrieval of optical and microphysical properties of thin water clouds by using ground based spectral IR measurements, 48th Oholo conference, Eilat, Israel, 2011.
6. E. Hirsch, E. Agassi, I. Koren, Retrieving microphysical and optical properties of haze by ground based spectral measurements and analysis in the longwave IR, *The 25th Annual Meeting of the Israeli Association of Aerosol Research*, Lopatie Conference Center, Weizmann Institute. Rehovot, 2012.
7. E. Hirsch, E. Agassi, I. Koren: Retrieving thin warm clouds properties by radiative transfer modeling and ground based spectral measurements and analysis in the longwave IR, IRS conference, Berlin, Germany, 2012.
8. E. Hirsch, E. Agassi, I. Koren: Estimation of the contribution of small, thin, warm clouds to the radiative forcing of a cloud field, using ground based measurements, IRS conference, Berlin, Germany, 2012.
9. E. Hirsch, O. Altaratz, I. Koren, R. Heilbulm, G. Feingold, E. Fredj, L. Pinto: How do cumulus clouds depend on their initiating parcel properties? AGU conference, San Francisco, U.S.A. 2013.
10. O. Altaratz, E. Hirsch, I. Koren, Z. Levin, E. Agassi: On the formation and characteristics of small "hesitant" clouds, the International Conference on

Clouds and Aerosol, in the Nanjing University of Information Science & Technology (NUIST), Nanjing, China, 2014.

11. O. Altaratz, I. Koren, E. Agassi, E. Hirsch: Surface measurements of warm cloud fields' properties, AGU Fall Meeting 2020.

GRANTS

1. E. Ben-Dor, A. Karnieli, N. Agam, E. Hirsch: Development of environmental application using novel technology of longwave IR hyperspectral remote sensing. Grant 86740, Ministry of Science and Technology, Israel, 2017.
2. E. Agassi (PI), I. Koren (PI), E. Hirsch (Co-PI), O. Altaratz (Co-PI): The probability of cloud free line of sight and the influence of thin cloudy layers on the performance of long-range ground and spaceborne based surveillance sensors. PAZY Grant No. 510027095, Israel, 2018.