

Prof. Rasha Abbasi

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Position

2018-Now Research Assistant Professor at the University of Utah, Salt Lake City, UT
2014-2018 Research Associate at the University of Utah, Salt Lake City, UT
2007-2012 Research Associate at the University of Wisconsin, Madison, WI

Education

Ph.D. (Physics) University of Utah, Salt Lake City, UT
2003–2007 “Applying New Methods to Finding Patterns in HiRes Stereo Data.”
Adviser: Professor Charles Jui
Masters (Physics) University of Utah, Salt Lake City, UT
2000–2003 “Orbiting Wide-Angle Light Collector”
Adviser: Professor Charles Jui
Bachelor (Physics) University of Jordan, Amman. Jordan.
1995–1999

Teaching Experience

2018 Developing and Teaching Computational Lab in Python for General Physics.
2018 Teaching Advanced Undergraduate Lab for Physics 3719.
2017 Developing and Teaching Computational Lab in Python for General Physics 2235.
2016 Teaching Advanced Undergraduate Lab for Physics 3719.
2015 Teaching Advanced Undergraduate Lab for Physics 3719.
2002 Teaching assistant for General Physics 2010.
2001 Teaching assistant for General Physics Lab 2025.
2001 Teaching assistant for General Physics Lab 2015.
2000 Teaching assistant for Engineering Physics 2210.

Supervised Student Research Projects

2018-now	Paul Caruso, Jr, on lightning detection with TA/LMA.
2017-now	Ryan Le Von, on Terrestrial Gamma Ray simulation.
2016-now	Jackson Remington, on lightning detection with TA/LMA.
2015	Zack Gibson, on radar detection of cosmic rays with TARA.
2009–2012	Craig Price, on the measurement of the solar anisotropy with IceCube.
2009	Dominick Rocco, on the seasonal variations of high energy cosmic ray muons with IceCube.
2009	Ryan Birdsall, on optimizing data quality for cosmic ray muons.
2008	Bradley Madajczyk, on data and simulation comparisons for cosmic ray muons.

Research Activities

2017-Now	Terrestrial Gamma Ray Flashes Detection with TA/LMA detector.
2014-2017	TARA, and the TA Project: <ul style="list-style-type: none">–Lightning detection with TA/LMA detectors.–Radar detection of cosmic rays using TARA.–Uncertainties of $\langle X_{max} \rangle$ from extrapolation of cosmic ray air shower model predictions.–Proton-Air and Proton-Proton cross section measurement at $\sqrt{s} = 95TeV$.–Supervised multiple students in various analysis.–Detector installation, monitoring, and maintenance.–Outreach activities.
2007-2012	IceCube Neutrino Observatory: Cosmic ray anisotropy study. <ul style="list-style-type: none">–Developed and refined the analysis that lead to the discovery of the cosmic ray anisotropy and it's energy dependence in the Southern sky.–Detector monitoring coordinator.–Supervised students in various analysis.–Outreach activities.
2003-2007	HiRes: Anisotropy study of HiRes stereo data <ul style="list-style-type: none">–Developed and applied Hough Transform technique to the HiRes stereo data.–Utilized the technique strength to search for arcs in the data.–Searched for correlations between these arcs and BL-Lacertae objects.–Developed and applied pattern finding techniques to search for

assorted patterns within the HiRes stereo data.

–Operated and Repaired HiRes (High Resolution Fly’s Eye) cosmic ray detector on a regular basis.

–Outreach activities.

Summer 2003 SLAC E-165 (FLASH): Nitrogen Fluorescence in Air Showers

–Participated in the collection of FLASH (Fluorescence in air showers) experiment at SLAC (Stanford Linear Accelerator Center) to determine the fluorescence yield of charged particles in air.

2000–2003 OWL: Orbiting Wide-angle Light Collector

–Calculated the observation aperture for OWL satellite based cosmic ray detector.

–Implemented the optics of the OWL detector into the simulation programs.

Invited Talks

- “ Ground Observations of Terrestrial Gamma Ray Flashes associated with Downward-Directed Lightning Leaders”,
26 October 2018, AtmoHEAD 2018, Capri, Italy.
- “ Recent results from the Telescope Array Experiment”,
15 November 2016, University of Alabama, Huntsville, Alabama.
- “ Recent results from the Telescope Array Experiment”,
25 October 2016, Michigan State University, East Lansing, Michigan.
- “ Recent results from the Telescope Array Experiment”,
18 April 2016, APS meeting, Salt Lake City, Utah.
- “Measurements of the proton-air cross section with high energy cosmic ray experiments.”,
6 October 2015, XLV ISMD meeting , Wildbad Kreuth, Germany.
- “Cosmic Ray Anisotropy With IceCube”,
25 September 2011, MANTS meeting , Uppsala, Sweden.
- “Evolution of the Cosmic Ray Anisotropy above 100 TeV as Observed by IceCube”,
3 February 2011, SnowPAC winter workshops , Salt Lake City, Utah.
- “Cosmic Rays Anisotropy measurement With IceCube”,
12 November 2010, Colloquium at the University of Wisconsin-Milwaukee.

- “Large scale Cosmic Rays Anisotropy measurement With IceCube”,
24 March 2010, SnowPAC winter workshops , Salt Lake City, Utah.
- “Large scale Cosmic Rays Anisotropy measurement With IceCube”,
29 February 2010, Seminar, Ohio State University. Columbus, Ohio.
- “IceCube Neutrino Observatory”,
27 October 2009, High energy Phenomena in Relativistic Outflows II. Buenos Aires,
Argentina.

List of Talks

- “Ground-level Observation of Gamma-ray Showers in Coincidence with Downward
Lightning Leaders”,
12 March 2018, ILDC/ILMC Conference, Fort Lauderdale, Florida.
- “Lightning Detection with the Telescope Array/Lightning Mapping Array Detectors”,
23 January 2018, University of Utah- Atmospheric Science Colloquium, Salt Lake City,
Utah.
- “Lightning Detection with the Telescope Array/Lightning Mapping Array Detectors”,
16 January 2018, Utah State University- Physics Colloquium, Logan, Utah.
- “ $\langle X_{max} \rangle$ Uncertainty from Extrapolation of Cosmic Ray Air Shower Parameters”,
12 October 2016, UHECR2016, Kyoto, Japan.
- “ Study of High-Energy Particles Correlated with Lightning at Utah’s Telescope Array
Cosmic Ray Observatory”,
13 July 2016, TGF Meeting, Huntsville, Alabama.
- “ Uncertainties in model predictions of $\langle X_{max} \rangle$ ”,
18 April 2016, APS meeting, Salt Lake City, Utah.
- “First result of the proton-air cross section of the telescope array experiment”,
8 August 2015, International Cosmic Ray Conference. The Hague, Netherlands.
- “Energy Dependence of the Large Scale Galactic Cosmic Rays Anisotropy Measured
With IceCube”,
10 August 2011, International Cosmic Ray Conference. Beijing, China.
- “Large scale Cosmic Rays Anisotropy as Observed With IceCube”,
12 October 2009, Center of Cosmology and Astro Particle Physics. Columbus, Ohio.
- “Large scale Cosmic Rays Anisotropy as Observed With IceCube”,
14 July 2009, International Cosmic Ray Conference. Lodz, Poland.
- “Large scale Cosmic Rays Anisotropy as Observed With IceCube”,
3 May 2009, American Physical Society Meeting. Denver, Colorado.

- “New Methods to Search for Cross-Correlations Between UHECR Data and BL Lac Sources ”,
24 April 2006, American Physical Society Meeting. Dallas, Texas.
- “Search for Cross-Correlations of BL Lacs with HiRes Stereo Data”,
25 October 2005, Four Corners Meeting. University of Colorado, Boulder, Colorado.
- “Cosmic Rays and Their Universe”,
23 September 2004, Undergraduate Seminar at the University of Utah.
- “Characterization of Orbiting Wide-angle Light-Collector (OWL)”,
4 December 2003, Undergraduate seminar at the University of Utah.
- “Characterization of Orbiting Wide-Angle Light-Collector (OWL)”,
25 October 2003, Four Corners Meeting. Arizona State University, Tempe, Arizona.

Proceedings

- “Ground-level Observation of Gamma-ray Showers in Coincidence with Downward Lightning Leaders”,
Submitted to AtmoHEAD 2018 Conference, for the Telescope Array Lightning Mapping Array Collaboration.
- “Ground-level Observation of Gamma-ray Showers in Coincidence with Downward Lightning Leaders”,
Submitted to ILDC/ILMC 2018 Conference, for the Telescope Array Lightning Mapping Array Collaboration.
- “ $\langle X_{max} \rangle$ Uncertainty from Extrapolation of Cosmic Ray Air Shower Parameters.”,
Submitted to International Conference on Ultra-High Energy Cosmic Rays (UHECR2016) with Prof. Gordon Thomson.
- “Measurements of the proton-air cross section with high energy cosmic ray experiments.”,
Submitted to XLV International Symposium on Multiparticle, Dynamics 2015 for the Telescope Array Collaboration.
- “Measurement of the Proton-Air Cross Section with Telescope Array’s Middle Drum Detector and Surface Array in Hybrid Mode.”,
Submitted to the International Cosmic Ray Conference 2015 for for the Telescope Array Collaboration.

- “Energy Dependence of the Large Scale Galactic Cosmic Rays Anisotropy Measured With IceCube”,
Submitted to the International Cosmic Ray Conference 2011 for for the IceCube Collaboration.
- “Measurement of the Solar Anisotropy with IceCube”,
Submitted to the International Cosmic Ray Conference 2011 for for the IceCube Collaboration.
- “IceCube Neutrino Observatory”,
Submitted to the High energy Phenomena in Relativistic Outflows II for the IceCube Collaboration. Int.J.Mod.Phys.D19:1041-1048,2010.
- “Cosmic Rays Anisotropy With IceCube”,
Submitted to the Center of Cosmology and Astro Particle Physics 2009 for the IceCube Collaboration.
- “ Large scale Cosmic Rays Anisotropy as Observed With IceCube”,
Submitted to the International Cosmic Ray Conference 2009 for for the IceCube Collaboration.
- “ Search for Multi-Point Correlation in Arrival Direction of Events Observed in Stereo by the High Resolution Fly’s Eye ”,
Submitted to the International Cosmic Ray Conference 2009 for the HiRes Collaboration.
- “An Alternative Method to Finding Patterns in HiRes Stereo Data ”,
Submitted to to the International Cosmic Ray Conference 2007 for the HiRes Collaboration.

Primary or Major Author Publications

- “ Gamma-ray Showers Observed at Ground Level in Coincidence With Downward Lightning Leaders. ” with the TA/LMA Collaboration, JGR-Atmosphere 123, 13 (2018)
- “ $\langle X_{max} \rangle$ Uncertainty from Extrapolation of Cosmic Ray Air Shower Parameters.”, with Prof. Grodon Thomson. arXiv:1605.05241.
- “ First Upper Limits on the Radar Cross Section of Cosmic-Ray Induced Extensive Air Showers. ” with the TARA Collaboration, Astroparticle Physics 87 (2017).
- “Measurement of the proton-air cross section with Telescope Arrays Middle Drum detector and surface array in hybrid mode” with the TA collaboration. Phys. Rev. D 92, 032007 (2015).

- “Telescope Array Radar (TARA) Observatory for Ultra-High Energy Cosmic Rays. ” with the TARA Collaboration, Nucl.Instrum.Meth. A767 (2014).
- “Observation of an Anisotropy in the Galactic Cosmic Ray arrival direction at 400 TeV with IceCube.” with the IceCube Collaboration, Astrophys.J., **746**:33,2012.
- “Measurement of the Large Scale Anisotropy of Cosmic Ray Arrival Directions with IceCube” with the IceCube Collaboration, Astrophys.J. **718**:L194,2010.
- “A Search for Three and Four Point Correlation in HiRes Stereo Data” with the HiRes Collaboration, arXiv:0901.3740, 2009.
- “Alternative Methods for Finding Patterns in HiRes Stereo Data” with the HiRes Collaboration, Astrophys. Volume 28, Issue 4-5, p385, 2007.

Additional Publications

- The Telescope Array RADAR Project
 - “Design, Construction and Operation of a Low-Power, Autonomous Radio-Frequency Data-Acquisition Station for the TARA Experiment” with the TARA Collaboration, Nucl.Instrum.Meth. A797 (2015).
- The Telescope Array Project
 - “Testing a reported correlation between arrival directions of ultrahigh-energy cosmic rays and a flux pattern from nearby starburst galaxies using Telescope Array data” with the TA collaboration. arXiv:1809.01573
 - “Mass composition of ultra-high-energy cosmic rays with the Telescope Array Surface Detector Data” with the TA collaboration. arXiv:1808.03680
 - “Study of muons from ultrahigh energy cosmic ray air showers measured with the Telescope Array experiment” with the TA collaboration. Phys.Rev. D98 (2018) no.2, 022002
 - “The Cosmic-Ray Energy Spectrum between 2 PeV and 2 EeV Observed with the TALE detector in monocular mode” with the TA collaboration. Astrophys.J. 865 (2018) no.1, 74
 - “Evidence of Intermediate-Scale Energy Spectrum Anisotropy of Cosmic Rays E1019.2 eV with the Telescope Array Surface Detector” with the TA collaboration. Astrophys.J. 862 (2018) no.2, 91
 - “Depth of Ultra High Energy Cosmic Ray Induced Air Shower Maxima Measured by the Telescope Array Black Rock and Long Ridge FADC Fluorescence Detectors and Surface Array in Hybrid Mode” with the TA collaboration. Astrophys.J. 858 (2018) no.2, 76
 - “Search for Anisotropy in the Ultra High Energy Cosmic Ray Spectrum using the Telescope Array Surface Detector” with the TA collaboration. arXiv:1707.04967.

- “The bursts of high energy events observed by the telescope array surface detector” with the TA collaboration. *Physics Letters A* 381 (2017) 2565-2572.
- “Search for EeV Protons of Galactic Origin” with the TA collaboration. *Astropart.Phys.* 86 (2017) 21-26.
- “Search for correlations between the arrival directions of IceCube neutrino events and ultrahigh-energy cosmic rays detected by the Pierre Auger Observatory and the Telescope Array ” with the TA collaboration. *JCAP01(2016)037*.
- “Report of the Working Group on the Composition of Ultra High Energy Cosmic Rays ” with the TA Collaboration. arXiv:1503.07540. To appear in the Proceedings of the UHECR workshop, Springdale USA, 2014
- “ The hybrid energy spectrum of Telescope Arrays Middle Drum Detector and surface array ” with the TA Collaboration. *Astropart.Phys.* 68 (2015) 27-44
- “Searches for Large-Scale Anisotropy in the Arrival Directions of Cosmic Rays Detected above Energy of 1019 eV at the Pierre Auger Observatory and the Telescope Array ” with the TA Collaboration. *Astrophys.J.* 794 (2014) 2, 172
- “Study of Ultra-High Energy Cosmic Ray Composition Using Telescope Array’s Middle Drum Detector and Surface Array in Hybrid Mode ” with the TA Collaboration. Published in *Astropart.Phys.* 64 (2014) 49-62
- “A Northern Sky Survey for Point-Like Sources of EeV Neutral Particles with the Telescope Array Experiment ” with the TA Collaboration. arXiv:1407.6145
- “Indications of Intermediate-Scale Anisotropy of Cosmic Rays with Energy Greater Than 57 EeV in the Northern Sky Measured with the Surface Detector of the Telescope Array Experiment” with the TA Collaboration. *Astrophys.J.* 790 (2014) L21

- IceCube Neutrino Observatory

- “Searches for periodic neutrino emission from binary systems with 22 and 40 strings of IceCube.” with the IceCube Collaboration, arXiv:1108.3023.
- “IceCube Sensitivity for Low-Energy Neutrinos from Nearby Supernovae.” with the IceCube Collaboration, arXiv:1108.0171.
- “Observation of Anisotropy in the Arrival Directions of Galactic Cosmic Rays at Multiple Angular Scales with IceCube.” with the IceCube Collaboration, Published in *Nucl.Phys.Proc.Suppl.* 212-213 (2011) 201-206.
- “A Search for a Diffuse Flux of Astrophysical Muon Neutrinos with the IceCube 40-String Detector.” with the IceCube Collaboration, arXiv:1104.5187.
- “Time-Dependent Searches for Point Sources of Neutrinos with the 40-String and 22-String Configurations of IceCube.” with the IceCube Collaboration, arXiv:1104.0075
- “Constraints on the Extremely-high Energy Cosmic Neutrino Flux with the IceCube 2008-2009 Data.” with the IceCube Collaboration, Published in *Phys.Rev.* D83 (2011) 092003.

- “Background studies for acoustic neutrino detection at the South Pole.” with the IceCube Collaboration, arXiv:1103.1216.
- “Constraints on high-energy neutrino emission from SN 2008D.” with the IceCube Collaboration, *Astron.Astrophys.* 527 (2011) A28.
- “Search for neutrino-induced cascades with five years of AMANDA data.” with the IceCube Collaboration, Published in *Astropart.Phys.* 34 (2011) 420-430.
- “Search for Dark Matter from the Galactic Halo with the IceCube Neutrino Observatory.” with the IceCube Collaboration, Published in *Phys.Rev.* D84 (2011) 022004.
- “First search for atmospheric and extraterrestrial neutrino-induced cascades with the IceCube detector.” with the IceCube Collaboration, arXiv:1101.1692.
- “Limits on Neutrino Emission from Gamma-Ray Bursts with the 40 String IceCube Detector.” with the IceCube Collaboration, arXiv:1012.2137.
- “Search for a Lorentz-violating sidereal signal with atmospheric neutrinos in IceCube.” with the IceCube Collaboration, Published in *Phys.Rev.* D82 (2010) 112003.
- “Measurement of the atmospheric neutrino energy spectrum from 100 GeV to 400 TeV with IceCube.” with the IceCube Collaboration, Published in *Phys.Rev.* D83 (2011) 012001.
- “The first search for extremely-high energy cosmogenic neutrinos with the IceCube Neutrino Observatory” with the IceCube Collaboration, Published in *Phys.Rev.* D82 (2010) 072003.
- “The Energy Spectrum of Atmospheric Neutrinos between 2 and 200 TeV with the AMANDA-II Detector” with the IceCube Collaboration, *Astropart.Phys.*34:48-58,2010.
- “IceCube Collaboration Contributions to the 2009 International Cosmic Ray Conference” with the IceCube Collaboration, arXiv:1004.2093.
- “Calibration and Characterization of the IceCube Photomultiplier Tube” with the IceCube Collaboration, *Nucl.Instrum.Meth.*A618:139-152,2010
- “Extending the search for neutrino point sources with IceCube above the horizon” with the IceCube Collaboration, *Phys.Rev.Lett.*103:221102,2009.
- “Limits on a muon flux from Kaluza-Klein dark matter annihilations in the Sun from the IceCube 22-string detector” *Phys.Rev.*D81:057101,2010.
- “Measurement of sound speed vs. depth in South Pole ice for neutrino astronomy.” with the IceCube Collaboration, *Astropart.Phys.*33:277-286,2010.
- “Search for muon neutrinos from Gamma-Ray Bursts with the IceCube neutrino telescope.” with the IceCube Collaboration, *Astrophys.J.*710:346-359,2010.
- “First Neutrino Point-Source Results From the 22-String IceCube Detector” with the the IceCube Collaboration, arXiv:0905.2253

- “Limits on the WIMP-Nucleon Scattering Cross-Section from Neutrino Telescopes” with the IceCube Collaboration, *Astrophys. J.* **04**:009, 2009.
 - “Limits on a Muon Flux from Neutralino Annihilation in the Sun with the IceCube 22-string Detector” with the IceCube Collaboration, arXiv:0902.2460. Submitted to *Phys. Rev. Lett.*
 - “Determination of the Atmospheric Neutrino Flux and Searches for New Physics with AMANDA-II” with the IceCube Collaboration, arXiv:0902.0675.
 - “Search for High-Energy Muon Neutrinos from the Naked-Eye GRB 080319B with the IceCube Neutrino Telescope” with the IceCube Collaboration, *Astrophys. J.* **691**:723-737, 2009.
 - “The IceCube Data Acquisition System: Signal Capture, Digitization, and Timestamping” with the IceCube Collaboration, arXiv:0810.4930. 2008.
 - “Solar Energetic Particle Spectrum on 13 December 2006 Determined by IceTop” with the IceCube Collaboration *Astrophys. J. Lett.* **689**: 65-68, 2008 .
 - “Search for Point Sources of High Energy Neutrinos with Final Data from AMANDA-II” with the IceCube Collaboration, *Phys. Rev. D.* **79**: 062001, 2009.
- High Resolution Fly’s Eye / HiRes
 - “Analysis of large-scale anisotropy of ultra-high energy cosmic rays in HiRes data.” with the HiRes Collaboration, arXiv:1002.1444.
 - “Indications of Proton-Dominated Cosmic Ray Composition above 1.6 EeV” with the HiRes Collaboration, *Phys.Rev.Lett.*104:161101,2010.
 - “Measurement of the Flux of Ultra High Energy Cosmic Rays by the Stereo Technique” with the HiRes Collaboration, Published in *Astropart.Phys.*32:53-60,2009.
 - “Search for correlations between HiRes stereo events and active galactic nuclei” with the HiRes Collaboration, *Astrophys. Volume 30, Issue 4, p175-179, 2008.*
 - “First Observation of the Greisen-Zatsepin-Kuzmin Suppression” with the HiRes Collaboration, *Phys. Rev. Lett.* **100**: 101101, 2008.
 - “An Upper Limit on the Electron-Neutrino Flux from the HiRes Detector” with the HiRes Collaboration, *Astrophys. J* **684**: 790-793, 2008.
 - “Techniques for measuring atmospheric aerosols at the high resolution Fly’s eye experiment” with the HiRes Collaboration, *Astrophys. Volume 25, Issue 1, p74-83, 2006.*
 - “A measurement of time-averaged aerosol optical depth using air-showers observed in stereo by HiRes” with the HiRes Collaboration, *Astropart. Phys.*, **25**: 93-97, 2006.
 - “Search for Cross-Correlation of Ultra-High Energy Cosmic Rays with BL Lacertae Objects” with the HiRes Collaboration, Submitted to *Astrophys. J.* July 2005, astro-ph/0507120.

- “Search for Point-Like Sources of Cosmic Rays with Energies above $10^{18.5}$ eV in the HiRes-I Monocular Data set” with the HiRes collaboration, submitted to *Astropart. Phys.*, astro-ph/0507663
- “Arrival Directions of Ultra-High Energy Cosmic Rays within the HiRes-I Monocular Data set: A Search for Overlaps with the Reported AGASA Clusters”, with the HiRes collaboration, submitted to *Astropart. Phys.*
- “Monocular Measurement of the Spectrum of UHE Cosmic Rays by the FADC Detector of the HiRes Experiment”, with the HiRes collaboration, *Astropart. Phys.* **23**: 157, 2005.
- “Observation of the Ankle and Evidence for a High-Energy Break in the Cosmic Ray Spectrum”, with the High Resolution Fly’s Eye Collaboration, *Phys. Lett. B* **619**: 271-280, 2005
- “Search for Point Sources of Ultra-High Energy Cosmic Rays Above 4×10^{19} eV Using a Maximum Likelihood Ratio Test”, with The High Resolution Fly’s Eye Collaboration, *Astrophys. J.* **623**: 164-170, 2005.
- “A Study of the Composition of Ultra-High Energy Cosmic Rays Using the High Resolution Fly’s Eye”, with The High Resolution Fly’s Eye Collaboration, *Astrophys. J.* **622**: 910-926, 2005.
- “Measurement of the Flux of Ultrahigh Energy Cosmic Rays from Monocular Observations by the High Resolution Fly’s Eye Experiment”, with the HiRes collaboration, *Phys. Rev. Lett.* **92**: 151101, 2004.
- “A Search for Arrival Direction Clustering in the HiRes-I Monocular Data above $10^{19.5}$ eV”, with the HiRes collaboration, *Astropart. Phys.* **22** (2004) 139-149.
- “Search for Global Dipole Enhancements in the HiRes-I Monocular Data above $10^{18.5}$ eV”, with the HiRes collaboration, *Astropart. Phys.* **21**:111,2004.
- “Study of Small-Scale Anisotropy of Ultrahigh Energy Cosmic Rays Observed in Stereo by HiRes”, with the HiRes collaboration, *Astrophys. J.* **610**:L73,2004.

- FLASH: Nitrogen Fluorescence in Air Showers

- “Techniques of the FLASH thin target experiment” with the FLASH collaboration, *Nucl. Instrum. Meth. A*, Volume 597, Issue 1, p. 32-36.,2008.
- “The FLASH thick-target experiment” with the FLASH collaboration, *Nucl. Instrum. Meth. A*, Volume 597, Issue 1, p. 37-40., 2008.

References

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