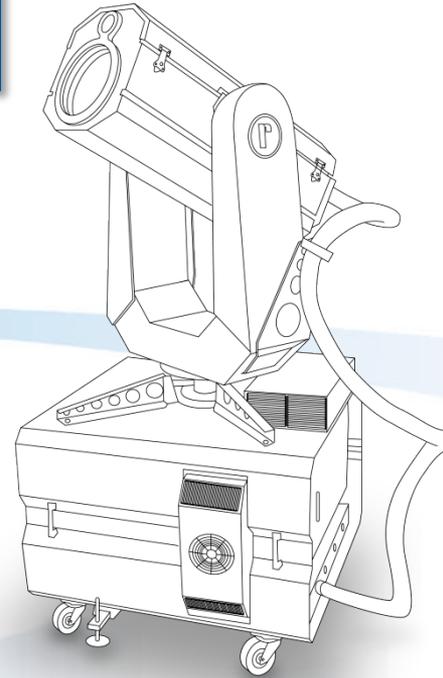# Company Presentation

May 2016

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Executive Summary

Who Are We?

- Founded in Athens, Greece in 2002

- Manufacturer of backscatter, depolarization and Raman LIDARs

- Systems for atmospheric applications only – records aerosols & related by-products

- Company designs systems (including making optical designs), integrates components, maintains systems and creates software

- Also services and integration

- Client base is traditionally researchers, but now also operational and commercial

- More than 50 X installations around the world

- Global coverage: Europe, USA, South America, Africa, India, China, Southeast Asia, etc + global network of distributors

- Certified ISO 9001:2008, conforms to ISO 28902-1:2012 for visual ranging with lidar, conforms to EARLINET requirements

What is a 'LIDAR'?
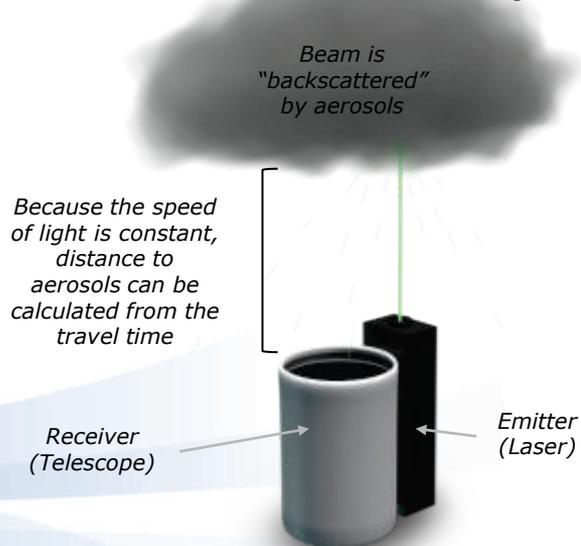
LIDAR - Light Detection And Ranging
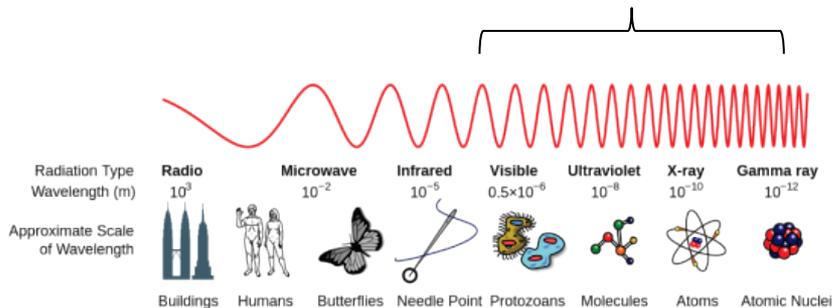
RADAR - Radio Detection And Ranging

LIDAR is a Remote Sensing Technique:

- Method of obtaining information about an object or quantity *without having the sensor in direct physical-contact with the object.*

- This is as opposed to in-situ methods (e.g. typical thermometers).

- For both active and passive remote sensing techniques there is a "medium" which carries the information. For a LIDAR this is light from a laser.

Beam is "backscattered" by aerosols

Because the speed of light is constant, distance to aerosols can be calculated from the travel time

Receiver (Telescope)

Emitter (Laser)

Activity Sectors / Major Applications

Research Institutes
(Atmospheric Physics Climatology)

Heavy Industry & Environmental Agencies
(Pollution Monitoring)

Meteorological Agencies
(Meteorology – Forecasting)

Aviation
(Clouds – Visibility)

Military?
(Clouds – Visibility)

2002... 2012 2014 2016 2017

For visibility, potentially also…
• Harbours and waterways
• Motorways and roads
• Oil platforms

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![raymetrics lidar systems] Products

CUSTOMIZED Research Grade Systems

Raymetrics has a background in LIDAR science – still a core market – leading to many options:

1. *3D scanning systems (backscatter, depolarization, Raman)*
2. *Vertical systems (backscatter, depolarization, Raman, multi-wavelength)*
3. *Components (telescopes, WSUs, upgrades)*
4. *Custom systems (DIAL, lidar stations)*
5. *Services (mining, leasing for research campaigns, installations)*

Raymetrics builds from a standard range of components instead of a standard set of products:

1. *Laser options (30, 60, 90mJ per pulse at 355nm)*
2. *Telescope size options (200, 300, 400mm – others on request)*
3. *Wavelength options (355p&s, 387, 408, 532p&s, 607, 1064nm)*
4. *Accessory options (climate control, UPS, hatch, rain sensor, GPS, etc)*

Large and small vertical systems

3D scanning systems

Custom LIDARs

Telescopes

Products

STANDARDIZED Operational Grade Systems

Option 1: Vertical

LIDAR Type: Raman depolarization LIDAR
Deployment Type: Vertical profiling
Model: LR111-D300
Clients: Meteorological Agencies,
                   Environmental Authorities
Applications: Volcanic ash detection, aerosol/pollution
                   monitoring, PBL studies, remote
                   humidity (night only)

Option 2: 3D Scanning

LIDAR Type: Raman, depol and/or backscatter LIDAR
Deployment Type: 3D scanning
Model: LR111-ESS-D200
Clients: Airports, Aviation Authorities,
                   Meteorological Agencies,
                   Environmental Authorities
Applications: Remote visibility, air quality/pollution
                   data, 3D cloud base, fog detection, PBL
                   studies

Vertical/3D Scanning

- ➢ Volcanic ash positive identification
- ➢ Altitude of volcanic ash layers (up to 20km)
- ➢ Remote humidity measurement (night only)
- ➢ Planetary Boundary Layer height
- ➢ Validation of numerical weather forecasting models
- ➢ *Remote* data for air quality/pollution models
- ➢ Aerosol discrimination (dust, man-made pollution, volcanic ash, fire smoke, marine particles)
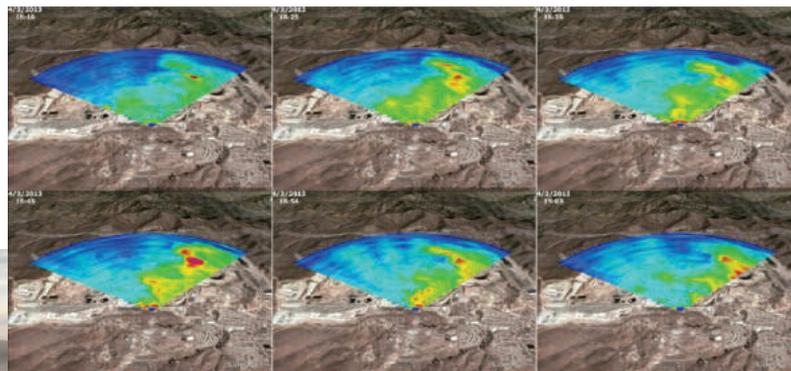
3D Scanning Required

- ➢ Incoming fog detection
- ➢ Remote visibility measurement (Slant Visual Range)
- ➢ Remote / 3D Cloud Base
- ➢ PBL mixing layer studies (up and down drafts)
- ➢ Remote Pollution and dust tracking
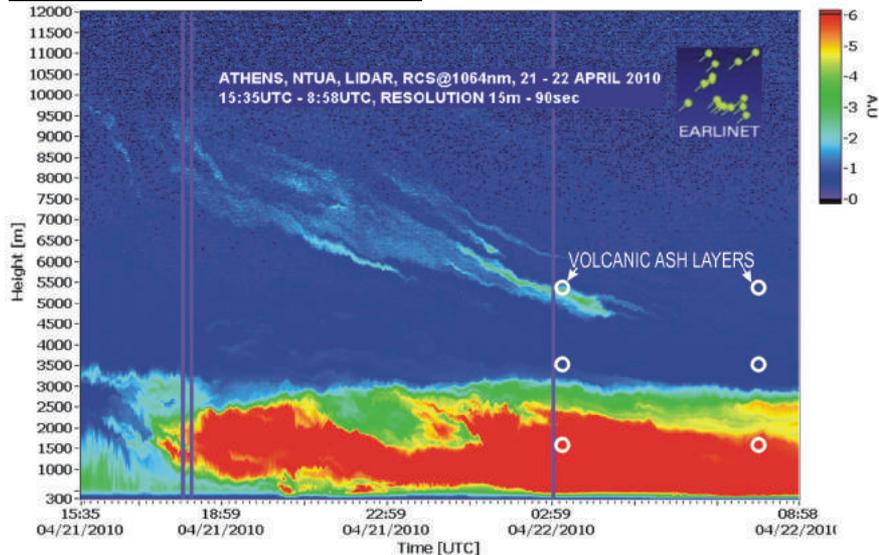
3D Pollution Tracking

3D scans showing evolution of dust pollution above the Pelambres copper mine in Chile

Image of a Raymetrics LIDAR in use for dust pollution tracking in a mine in Chile
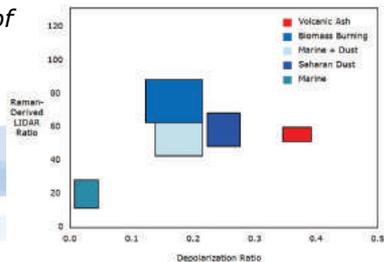
Volcanic Ash Identification

Volcanic ash identified using a Raymetrics LIDAR from the Eyjafjallajokull eruption in 2010 (data courtesy of NTUA)


System installed for Met Office (UK) – part of a network of 11 Raymetrics LIDARs for ash detection

Technique for distinguishing ash using an aerosol LIDAR – depolarization ratio plotted against Raman-derived LIDAR ratio (Adapted from Groß et al, 2012)

Remote Visibility / 3D Cloud Base

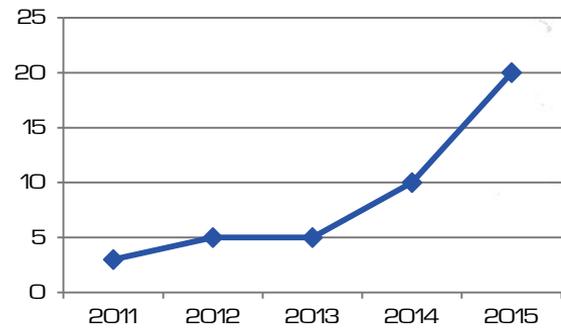*Raymetrics 3D scanning LIDAR being installed at Heydar Aliyev International Airport in Azerbaijan*
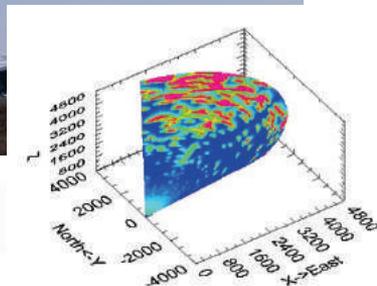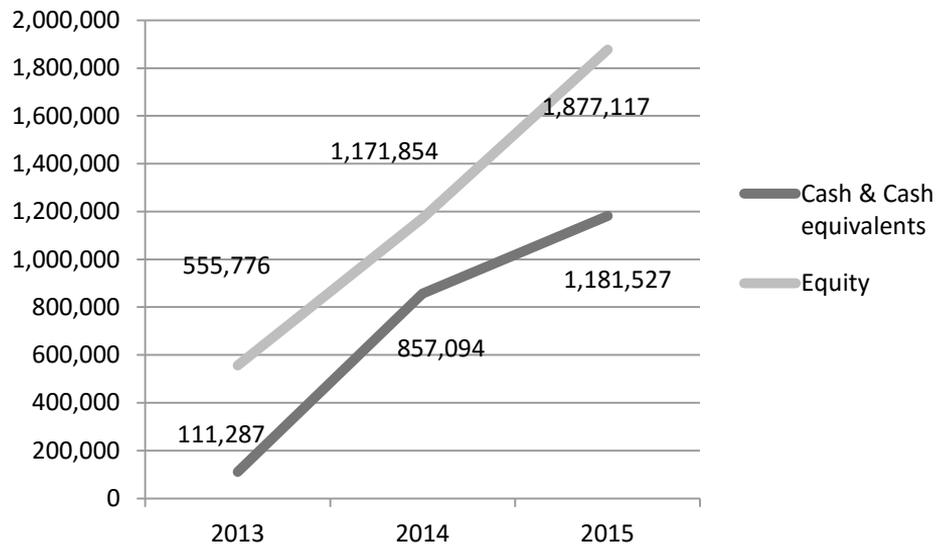
Raymetrics 3D cloud data

System Locations

Number of Sales Per Year

Geographical Sales Analysis 2013-2015

Pie chart (Geographical Sales Analysis):
- 7.69%
- 3.22%
- 1.55%
- 30.66%
- 56.88%

Legend:
- Europe
- Asia
- Africa
- America
- Hellas

Line chart (Cash & Cash equivalents / Equity), 2013–2015:

Equity: 555,776 → 1,171,854 → 1,877,117

Cash & Cash equivalents: 111,287 → 857,094 → 1,181,527

Legend:
- Cash & Cash equivalents
- Equity

Financial Data
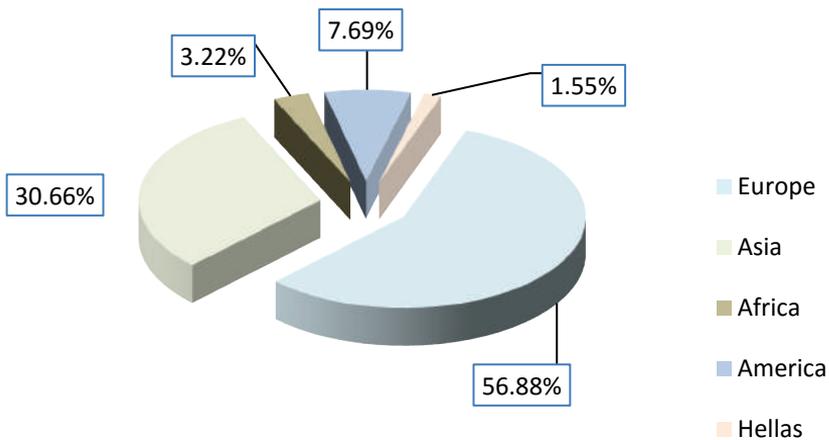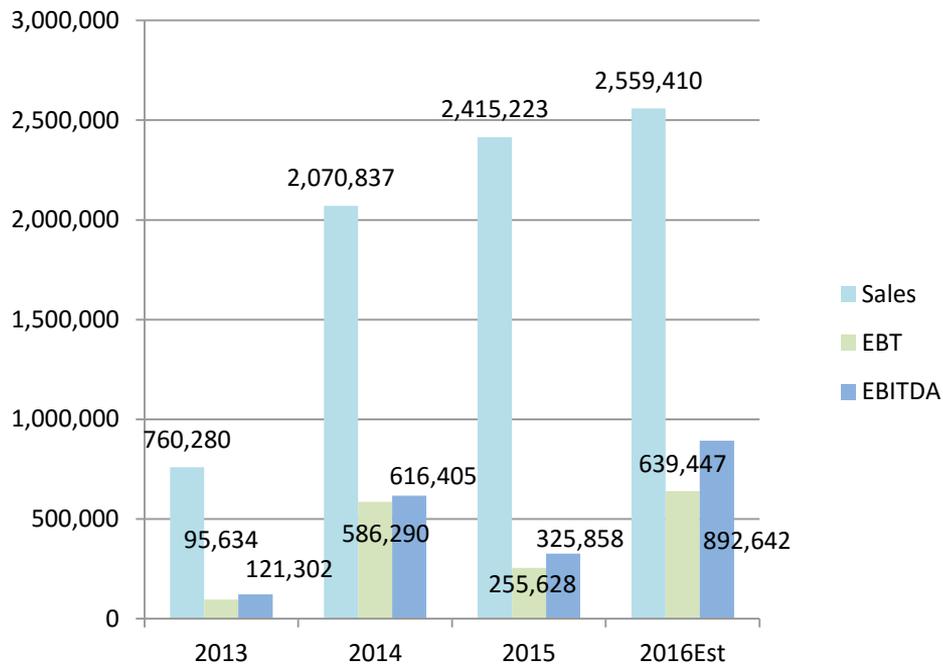
RAYMETRICS SA	2013	2014	2015
ASSETS			
Non Current Assets	90.544	89.851	266.420
Current Assets	1.124.512	1.659.518	2.408.622
Total Assets	**1.215.056**	**1.749.369**	**2.675.042**
EQUITY & LIABILITIES			
Total Equity	555.776	1.171.854	1.877.117
Non - Current Liabilities	6.533	7.140	10.879
Current Liabilities	652.747	570.375	787.046
Total Liabilities	**1.215.056**	**1.749.369**	**2.675.042**

Summary

- Aerosol LIDARs were developed in the 1960s – LIDAR is an established technique among scientists and the technology is relatively mature

- But the capabilities and uses of aerosol LIDARs are only now just being recognized by industry - Raymetrics is helping bring it to the marketplace

- Aerosol LIDARs can augment current systems (e.g. providing higher resolution atmospheric data, or providing data for remote air quality studies)

- Aerosol LIDARs can also provide entirely new data which cannot be obtained by other means (e.g. remote visibility, altitudes of volcanic ash layers)

- There are currently very few companies able to build aerosol LIDARs - Raymetrics is one of them (and is probably the number one company in the world)

- The company's main scientific advisor is Prof. Alex Papagiannis from the National Technical University of Athens (NTUA), who was in 2015 voted President of ICLAS (International Coordination group for Laser Atmospheric Studies – the most important LIDAR organization in the world).

- Raymetrics is at the forefront of new, cutting edge technology with applications from aviation to meteorology to environment

raymetrics lidar systems

Key Client References

Aviation (2015)

AZAL AZERBAIJAN AIRLINES

For Heydar Aliyev Airport, Azerbaijan

National Environment Agency
Safeguard · Nurture · Cherish

For Changi Airport, Singapore

SESAR JOINT UNDERTAKING

Braunschweig airport (testing only)

Meteorology (2014)

Met Office
www.metoffice.gov.uk

Met Office (UK)

DWD

German Weather Service

ISAC

For Italian Environmental Agency

KMA Korea Meteorological Administration

For Centre for Atmospheric Studies and Earthquake Research (CASER)

METEO FRANCE
Toujours un temps d'avance

French Met Service

Research (2002)

UNIVERSITY OF SOUTH CAROLINA

DLR

German Aerospace Centre

esa

European Space Agency

Commercial (2012)

ANTOFAGASTA PLC

CODELCO
Orgullo de Todos