

0x1a

World Trade Center Hot Spots

20 September 2009(created 31 January 2008) references

Other Underground Fires

Thermite

NIST Claims Molten Steel In The Wreckage Was Due To Long Term Combustion Within The Debris Pile

Can a collapsing building melt steel?

World Trade Center Molten Metal Videos

[Molten Metal Was Observed Before, Shortly After, And Long After The Twin Towers Destruction](#)

[World Trade Center Tower Steel Sample Shows Severe Damage Due To A High Temperature Corrosion Attack Which Melted The Steel](#)

[World Trade Center 7 Steel Samples Show Severe Damage Due To A High Temperature Corrosion Attack Which Melted The Steel](#)

[Destruction of Evidence](#)

[World Trade Center "Meteorites"](#)

[World Trade Center Remote Sensing Missions](#)

[World Trade Center Dust](#)

[Journal Of 9/11 Studies: Extremely High Temperatures During The World Trade Center Destruction](#)

[Melting Steel With Gravitational Potential Energy: The Mechanical Equivalent Of Heat](#)

Important notes:

1. The WTC debris pile fire was [oxygen-poor](#).
2. The images below represent surface temperatures, the "optical depth" is at the most a few millimeters. ([ACS919](#))
3. [Thermal Data was Used to Direct Firefighting Efforts.](#)
4. [OSHA safety experts were concerned about the effects of the extreme heat on the crane rigging and the hazards of contact with the hot steel.](#)
5. [The WTC dust contains large amounts of un-reacted explosives.](#)
6. This page is updated frequently.



Red Hot Debris. The removal of debris from the collapsed areas requires the safe lifting and maneuvering of very heavy steel beams, often twisted and tangled from the force of the collapse. Some beams pulled from the wreckage are still red hot more than 7 weeks after the attack, and it is suspected that

temperatures beneath the debris pile are well in excess of 1,000°F. [liro.com](#)

Joe Allbaugh, the Director of FEMA, was interviewed by Bryant Gumbel of CBS news on October 10 2001:

GUMBEL: We're seeing a lot of video of smoke pouring up from the debris.

ALLBAUGH: Correct.

GUMBEL: And we're hearing there are places where temperatures are still approaching and sometimes exceeding a thousand degrees.

ALLBAUGH: That's right.

GUMBEL: Why? Why do we have these hot spots? What's going on?

ALLBAUGH: Well, you have normal debris, you know, computers, paper, you have some areas that are hot pockets because of fuel. It's just too hot for rescuers to get into those areas. So we do not know yet what's in those areas, other than very hot, molten material. [FEMA.gov](#)

Source publication date: CBS Early Show 10/04/01

Interviewer: Bryant Gumbel

Witness: Joe Allbaugh

Date molten metal was observed: up to 10/04/01

Leslie Robertson, the structural engineer responsible for World Trade Centers 1, 2, 4, 5, 6 and all subgrade levels, stated "As of 21 days after the attack, the fires were still burning and molten steel was still running." [SEAU.org](#)

Source publication date: SEAU News Volume VI Issue II 10/2001

Interviewer: James M. Williams October 5, 2001 National Council of Structural Engineers Associations 9th Annual Conference.

Witness: Leslie Robertson

Date molten metal was observed: up to 10/02/01

"I saw melting of girders in World Trade Center." -Structural Engineer [Abolhassan Astaneh pbs.org audio pbs.org](#)

"I talked to many contractors and they said they actually saw molten metal trapped, beams had just totally had been melted because of the heat." -Chaplain Herb Trimpe [recordonline.com audio](#)

Peter Tully, president of Tully Construction of Flushing, N.Y., told AFP that he saw pools of "literally molten steel" at the World Trade Center. [americanfreepress.net](#)

Source publication date: 09/03/2002

Witness: Peter Tully

Date molten metal was observed: "more than a month after the collapse" up to 10/11/01

A NY firefighter described steel flowing at ground zero. "You'd get down below and you'd see molten steel — molten steel! — running down the channel rails. Like you're in a foundry... like lava... from a volcano. [video source](#)

A reporter with rare access to the debris at ground zero "descended deep below street level to areas where underground fires still burned and steel flowed in molten streams." [theatlantic.com cached copy](#)

Source publication date: July/August 2002 Atlantic Monthly

The owner of Controlled Demolition Inc., [Mark Loizeaux](#) stated the molten steel was found "three, four, and five weeks later, when the rubble was being removed,". He said molten steel was also found at [7 WTC](#), which collapsed mysteriously in the late afternoon. [americanfreepress.net](#)

Fires burned and molten steel flowed in the pile of ruins still settling beneath her feet. -Sarah Atlas of New Jersey's Task Force One Urban Search and Rescue [upenn.edu](#)

"Fires are still actively burning and the smoke is very intense," reports Alison Geyh, PhD. "In some pockets now being uncovered, they are finding molten steel." [jhsph.edu](#)

A veteran of disasters from the Mississippi floods Mt. St. Helens, Burger said it reminded him most of the volcano, if he forgot he was in downtown Manhattan. "Feeling the heat, seeing the molten steel, the

layers upon layers of ash, like lava, it reminded me of Mt. St. Helen's and the thousands who fled that disaster," he said. Additionally he stated "Shards of steel lay upon shards of steel, shifting and unstable, uncovering red hot metal beams excavated from deep beneath layers of sub-floors, exposing further dark crevasses." neha.org

"They showed us many fascinating slides" he continued, "ranging from molten metal which was still red hot weeks after the event, to 4-inch thick steel plates sheared and bent in the disaster." -Dr Keith Eaton istructe.org.uk

"Smoke constantly poured from the peaks. One fireman told us that there was still molten steel at the heart of the towers' remains. Firemen sprayed water to cool the debris down but the heat remained intense enough at the surface to melt their boots." -Guy Lounsbury of New York Air National Guard's 109th Air Wing [source](#)

A NY Department of Sanitation spokeswoman said "for about two and a half months after the attacks, in addition to its regular duties, NYDS played a major role in debris removal - everything from molten steel beams to human remains...." wasteage.com

"the ominous groaning of weakened structures overhead, or, in the early days, the streams of molten metal that leaked from the hot cores and flowed down broken walls inside the foundation hole." -William Langewiesche [source p32 cached copy](#)

He remembers seeing in the darkness a distant, pinkish glow—molten metal dripping from a beam—but found no signs of life. -Lee Turner of The Boone County Firefighters usnews.com

"In the first few weeks, sometimes when a worker would pull a steel beam from the wreckage, the end of the beam would be dripping molten steel," Fuchek said. gcn.com

As late as five months after the attacks, in February 2002, firefighter Joe O'Toole saw a steel beam being lifted from deep underground at Ground Zero, which, he says, "was dripping from the molten steel." fallenbrothers.com[cached copy](#)

...numerous fires were still burning and smoldering. Underground it was still so hot that molten metal dripped down the sides of the wall from Building 6. 9-11commission.gov (2) (3)

Richard Garlock, a structural engineer for LERA said "Going below, it was smoky and really hot... The debris past the columns was red-hot, molten, running." pbs.org

Vance Deisingnore, OSHA Officer at WTC, reported the following to Jim McKay, Post-Gazette Staff Writer, on September 11, 2002 "a fire truck 10 feet below the ground that was still burning two weeks after the Tower collapsed, its metal so hot that it looked like a vat of molten steel." thenewliberator.com

Father Edward A. Malloy, on site 40 days after the disaster stated "Firefighters atop a number of ladder trucks were spraying in the areas of greatest smoke. The average temperature beneath the rubble is said to be 1500F so that when steel is brought up it is molten and takes two or three days to cool down." nd.edu

Ed Pfister, a veteran of three hurricanes and two flood relief efforts, and a member of the elite Disaster Medical Assistance Team, wrote in his diary "deep below ground a portion of the pile was still on fire and boiled with molten material. Sometimes, open flame would erupt as a crane pulled debris out and air rushed in. Fire hoses constantly poured streams of water causing huge billowing steam clouds to rise up over the site into the huge lights above." NIH.gov

Source publication date: 10/30/2001

Interviewer: Rich [McManus](#)

Guy Lounsbury with the 109th Air Wing of the New York Air National Guard wrote "The men who work on this must constantly change their boots as the heat melts them. Two weeks after the attack, one fireman told us that there was still molten steel at the heart of the towers' remains." nycap.rr.com

A group of veteran ironworkers eating lunch while staring at the steel skeleton of a new building going up on West Third Street when one commented on "how much easier it was to eat a sandwich in front of steel that was strong and straight and new, not molten and mangled and laden with debris." nytimes.com

Fire Department Chief Mike Donoho of Texas Task Force 1 Urban Search and Rescue described the scope of the destruction, "Everything had its own look. In the area surrounding what was the two twin towers, there were several buildings still standing that were burned from top to bottom, and some of them were damaged by the collapse. But the two towers — they were 110-story buildings. And there was nothing that you could put your hands on that resembled anything that would tell you this once was two 110-story office buildings. What you had were large columns of steel that were just stuck into massive amounts of molten steel and other metals, that had just fused together from the heat and bonded together from the strength of the collapse. We dug and we dug and we dug, and we cut and we cut and we cut, and we did not see anything that resembled any type of furniture, any type of personal belongings. We found some pieces of things like a telephone, things like that. I think we found credit cards a few times, and we found a couple of stuffed animals. But you would expect to see, like, a bunch of desks, a bunch of chairs. The only way I can explain it is, if you take a car and put it in one of those machines where they crush it and make it look like a cube, and you can't recognize what it is, that's what the whole area looked like. It looked like a massive, molten mess that had been fused together, like a car that had been cubed and crushed. With all that heavy, heavy stuff, there were wires, rebar, concrete. Most of it was just steel. A lot of what we were walking on was just molten steel. theeagle.com

The workers go through three pairs of rubber boots a day because they melt in the three-week-old fire of molten metal and jet fuel. The health hazards are everywhere: the fire, molten metal, the lack of breathable air and 3000+ decomposing bodies. illusiongenius.com

Each story has its differences. Some told of 10-hour car drives and arriving in the black of night, the same calendar day as the towers were hit. Others remembered taking military transport - a C-141 in Deeds' case - a few days later. Others remember molten metal still dripping under the Pile more than a week after the attack. [source](#)

"In mid-October, in the evening," said Thomas A. Cahill, a retired professor of physics and atmospheric science at the University of California, Davis, "when they would pull out a steel beam, the lower part would be glowing dull red, which indicates a temperature on the order of 500 to 600 °C. And we know that people were turning over pieces of concrete in December that would flash into fire - which requires about 300 °C. So the surface of the pile cooled rather rapidly, but the bulk of the pile stayed hot all the way to December." acs.org

Some beams pulled from the wreckage are still red hot more than 7 weeks after the attack, and it is suspected that temperatures beneath the debris pile are well in excess of 1,000°F. liro.com

Ferer was one of several people in a visiting United Services Organization (USO)-Tribeca group who had lost family members. As they visited troops, they carried Port Authority pins, baseball caps, and a piece of molten steel from the WTC. wiley.com

No matter when they went, the odor of molten steel, pulverized concrete and charred flesh burned their throats, lingering in their lungs. ecnext.com

New York mayor Rudy Giuliani said "They were standing on top of a cauldron. They were standing on top of fires 2,000 degrees that raged for a hundred days." nymag.com

Another danger involved the high temperature of twisted steel pulled from the rubble. Underground fires burned at temperatures up to 2,000 degrees. As the huge cranes pulled steel beams from the pile, safety experts worried about the effects of the extreme heat on the crane rigging and the hazards of contact with the hot steel. And they were concerned that applying water to cool the steel could cause a steam explosion that would propel nearby objects with deadly force. Special expertise was needed. OSHA called in structural engineers from its national office to assess the situation. They recommended a special handling procedure, including the use of specialized rigging and instruments to reduce the

hazards. [OSHA.gov](http://www.osha-slc.gov)

The "hot spots", where intensely burning debris generated temperatures in excess of 1300 degrees Fahrenheit, posed a significant danger to relief workers. NASA had an instrument that could provide information that would be useful to emergency responders. NASA's Airborne Visible infrared Imaging Spectrometer (AVIRIS) science instrument was capable of providing data that could be used to filter smoke and locate extreme hot spots. [erau.edu](http://www.erau.edu)

The temperature at the core of "the pile," is near 2000 degrees Fahrenheit, according to fire officials abcnews.go.com

Firefighters and other responders contended with intense heat associated with the super-heated steel for weeks; some were coming back from shifts with the bottoms of their boots melted. [gwu.edu](http://www.gwu.edu)

Two weeks after the attack, the rubble, the Pile, is still 7 stories tall. Below, in the Pit it burns like the gates of hell. It is 1200 degrees, so hot that the steel work lifted by the grapplers comes out soft. I've never seen anything like this". [ukfssart.org.uk](http://www.ukfssart.org.uk)

Some of the structural steel sections being removed were still red-hot. [engr.psu.edu](http://www.engr.psu.edu)

"The fires are so hot in pockets on the Pile that some of the firefighters change boots 3-4 times a day. Smoke and flame come up from the Pit deep within the Pile when a piece of heavy equipment with a huge grappler pulls out a mass that allows a swish of oxygen inside". [ukfssart.org.uk](http://www.ukfssart.org.uk)

The rubble pile was so hot in places that it melted the soles of work boots. Companies donated supplies of work shoes, and construction workers laboring on the hotter parts of the rubble pile reportedly went through a pair a day. A boot wash was established where workers could cool their feet. [rand.org](http://www.rand.org)

At the World Trade Center, the rubble pile was so hot in places that it melted the soles of boots (a problem noted by members of the trades, lawenforcement, and firefighter panels). Work shoes with steel reinforcements in the soles and toes protected feet against punctures by sharp objects but often could not be worn because they conducted and retained the heat, causing blistered or scorched feet. [rand.org](http://www.rand.org)

The dogs were trained to sniff out bodies. They weren't trained to recognize heat. So when they hopped on a smoldering I-beam [some of which were hot enough to melt the firefighters' rubber-soled boots] they'd get hurt. Some of them even ignited," said Bellone, who added that the firefighters were often slowed down because they stopped to care for their four-footed comrades, many of which could not be saved. "We retired a lot of them because of burns or just stress," he said. The Federal Emergency Management Agency team assembled at the site included scores of veterinarians. [mit.edu](http://www.mit.edu)

Firemen and hazardous materials experts stated that, six weeks after 9/11, "There are pieces of steel being pulled out [from as far as six stories underground] that are still cherry red" and "the blaze is so 'far beyond a normal fire' that it is nearly impossible to draw conclusions about it based on other fires." [nydailynews.com](http://www.nydailynews.com) ([cached copy](#))

Ground Zero at the World Trade Center was a search site like few others after a major disaster event. Multiple sources of hazards were everywhere. There were shards of steel piled on steel, a two-million-ton pile of debris, red hot steel beams still being pulled from the earth, crevasses, holes, unstable ground, still burning fires, possible asbestos exposure, and caustic fumes that may have contained mixtures of benzene, methane gas and other chemicals. [michigan.gov](http://www.michigan.gov) ([maloney.house.gov](http://www.maloney.house.gov))

"The first indication of "Ground Zero" is the smoke. It's still smoking. Many of the beams are still red hot as they are uncovered, and start new fires as the oxygen reaches them." -Congressman Pete Hoekstra [hoekstra.house.gov](http://www.hoekstra.house.gov)

The pile of debris after 30 days of removal operations was still gigantic, over three stories high, with structural steel projecting 7-10 stories into the air. The steam, dust, noise, steel and myriad activities were larger than anything I have ever seen. Temperatures in the pile were over 1,200 °F. Every time an

area was opened, fire started in any buried combustible debris. Water trucks and fire engines were used continually. The high temperature debris and water created steam. [army.mil](#) ([cached copy](#))

"It was determined that 3 million gallons of water were hosed on site in the fire-fighting efforts between 9/11 and 9/21"... "In addition, there were 2 episodes of rain during the same 10 day period after the attack: on [9/14](#) and [9/20](#), totaling 0.9 million gallons of water per Bathtub area. Considering the neighboring area, one can take 1 million gallons from the rain. Therefore, a total of 4 million gallons of water percolated through the debris in the first 10 days and collected at the bottom of the Bathtub." [Inl.gov](#)
<http://www.marinefirefighting.com/Pages/Newsletters/Newsletter9.htm>

2000 gallons of Pyrocool FEF foaming agent were sprayed on the "pile" starting September 28th. [newscientist.com](#)

"You couldn't even begin to imagine how much water was pumped in there," said Tom Manley of the Uniformed Firefighters Association, the largest fire department union. "It was like you were creating a giant lake." [cbsnews.com](#)

Both NYCDDC and OSHA officials told us that the WTC site was under continuous dust suppression, and the latter said this dust suppression was very successful. An EPA *On-Scene* Coordinator told us that once dust suppression began, water was sprayed wherever there was dust and, to the best of his knowledge, this practice was successful. [salemstate.edu_p46](#)

"When I am not moving, I notice that the soles of my boots are melting from the heat inside the pile of debris." [source](#)

"As in a stubborn coal mine fire, the combustion taking place deep below the surface is in many places not a fire at all. Instead, oxygen is charring the surfaces of buried fuels in a slow burn more akin to what is seen in the glowing coals of a raked-over campfire. But the scale of the trade center burning is vast, with thousands of plastic computers, acres of flammable carpet, tons of office furniture and steel and reservoirs of hydraulic oil and other fuels piled upon one another. Steel beams pulled from the debris at times are so hot they are cherry red. Benzene, propylene, styrene and other chemicals generated by the combustion of computers, office products and fuels drift through the air." [nytimes.com](#)



"2 weeks later, molten steel" North Tower, 27 September 2001. ([Frank Silecchia](#)).

[Original File](#)

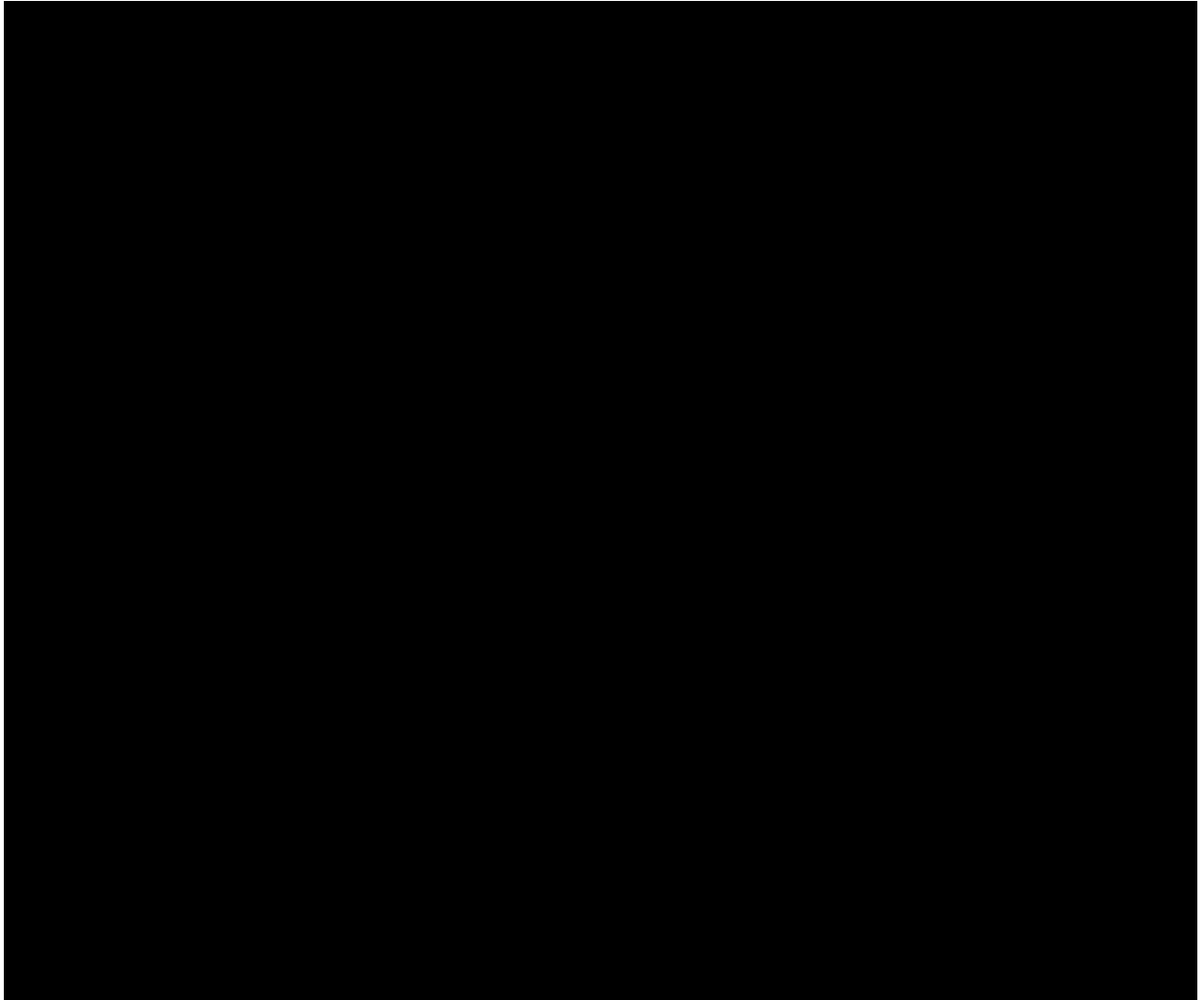
[Steel Temperature Color Chart \(source\)](#)



Red hot metal, 27 September 2001. Picture by Franck Sillechia, ironworker. ([source](#))

[Hi Resolution Scan](#)

[Hi Resolution Scan With Color Adjusted](#)



John Gross of **NIST** giving a lecture at the University of Texas



SPOT satellite image of Manhattan, using the **HRVIR** (High Resolution Visible Infra Red instrument) on **SPOT 4**, acquired on September 11 at 11:55 AM EST, 3 hours after two planes crashed into the World Trade Center. The colors result from the use of infrared bands to identify the actual fire hot spots (see red spots near the base of the smoke plume). The SPOT satellites orbit at an altitude of 822 km. (c) CNES/SPOT Image 2001 [full image](#)

Resolution: 20 meters; Acquisition time: 09/11/01 11:55 AM EDT; Orbital altitude: 822 km

Band combination: Not specified, but presumed to be:

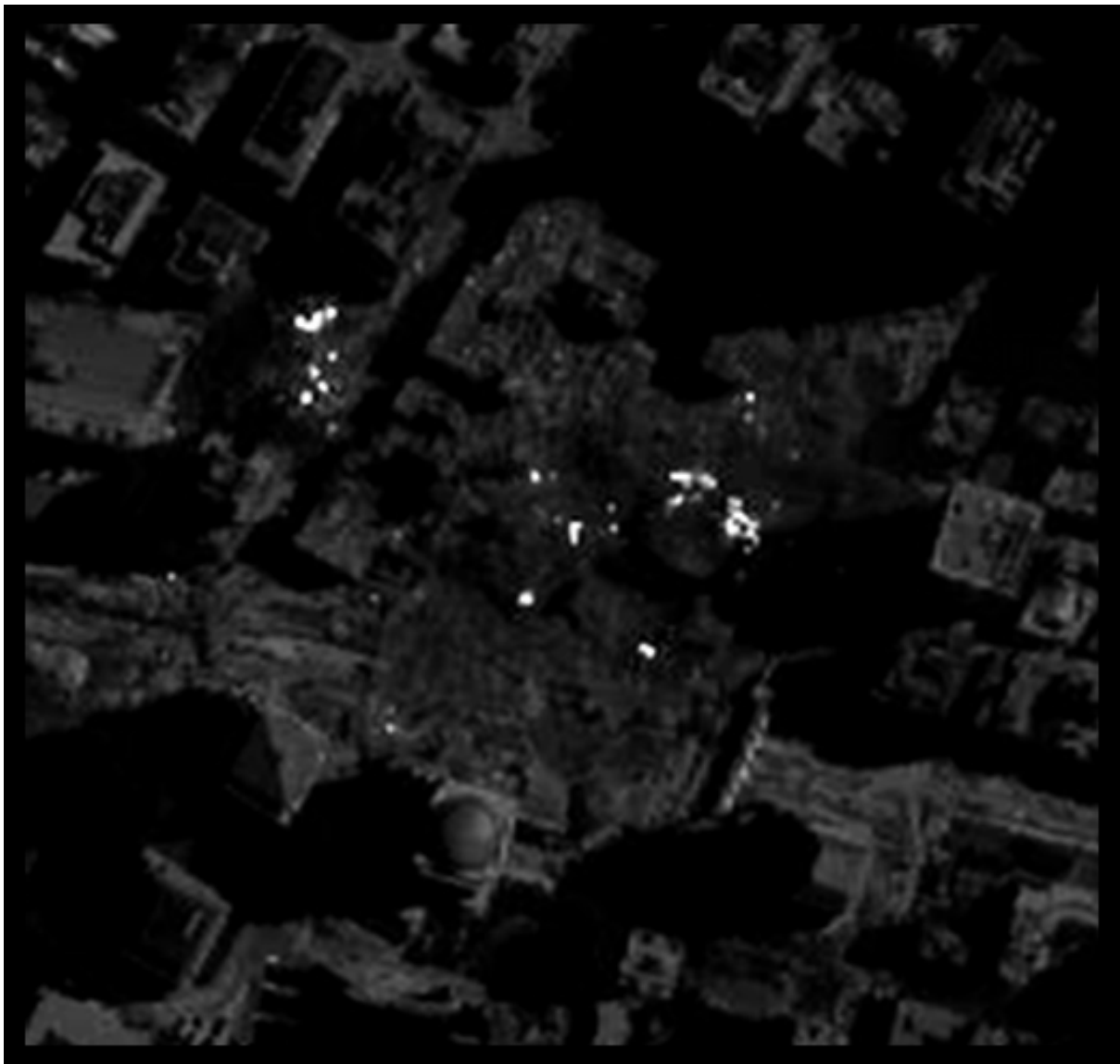
R 0.79 - 0.89um

G 0.61 - 0.68um

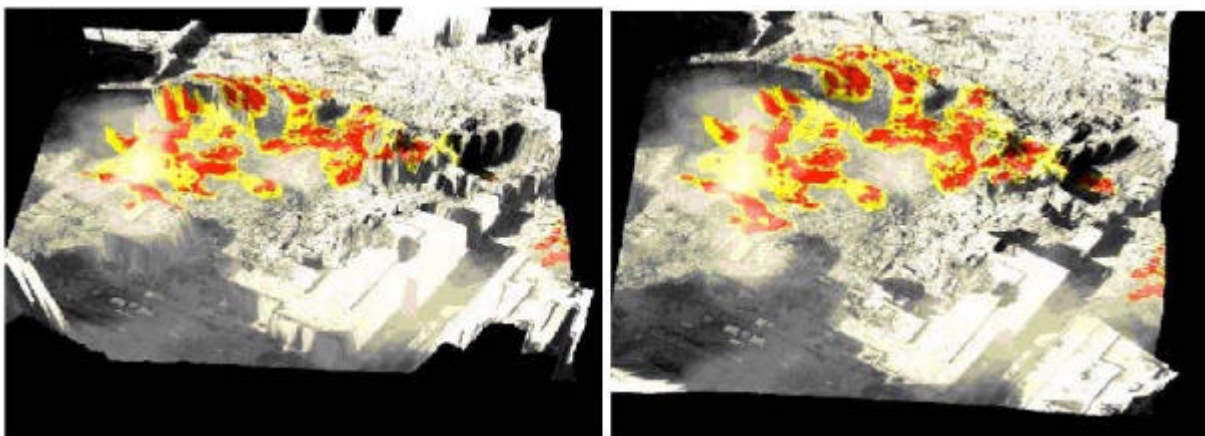
B 0.50 - 0.59um

ncsu.edu

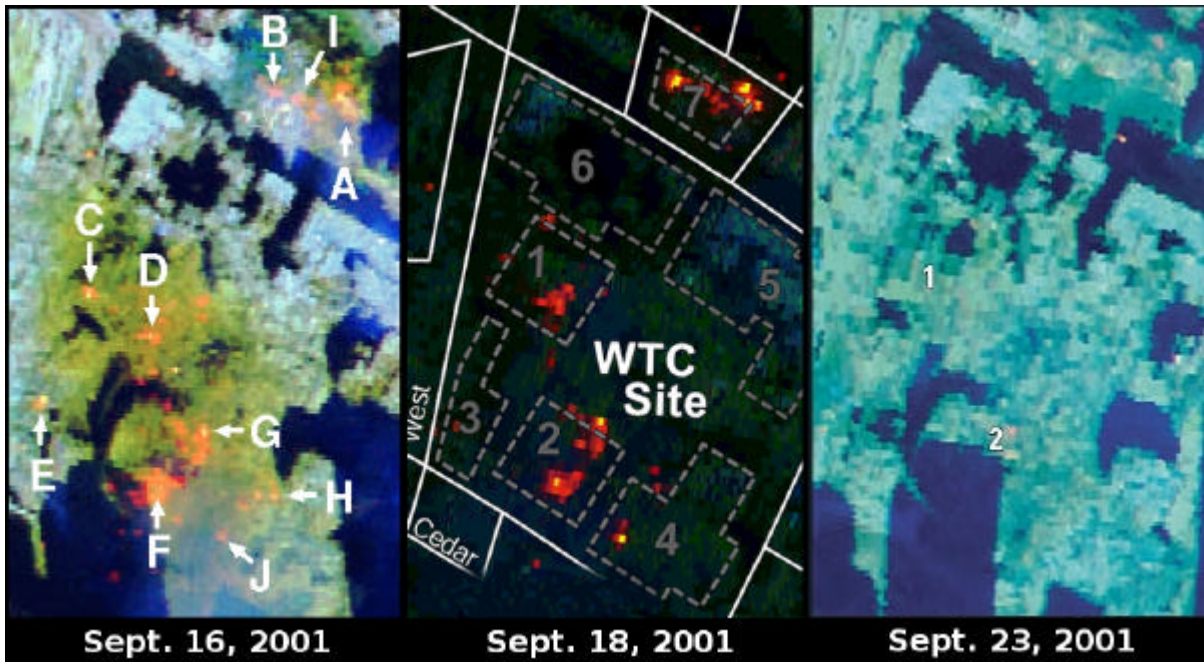
As part of the World Trade Center disaster response, the NASA Airborne Visible/Infrared Imaging Spectrometer (**AVIRIS**) was flown over the site on the 16th and 18th of September 2001. AVIRIS measures the solar reflected spectrum from 370 to 2500-nm at 10-nm sampling. For this flight the data were acquired at 1.5-m spatial sampling with image coverage of the entire disaster site. AVIRIS measurements are spectrally, radiometrically, spatially calibrated in the laboratory and validated in flight. Rapid examination of the World Trade Center AVIRIS data in the 2300 nm spectral region showed numerous high radiance targets indicative of burning fires. A new spectroscopic algorithm was implemented to simultaneously solve for the temperature and fractional area of the fires. This algorithm uses the Planck function in conjunction with the full spectral shape measured by AVIRIS to determine the temperature and fractional area of the fire. This spectral algorithm overcomes the ambiguity between temperature and area that exists in single-spectral-band temperature estimation methods. With these AVIRIS data set and new algorithm, 8 hot spot zones were identified in the September 16th data with temperatures ranging from 700K to 1019K and fractional areas from 1.1 to 18%. Analysis of the data set acquired on September 18th showed 7 of the hot spot zones still present with temperatures ranging from 471K to 952K and fractional areas from 0.5 to 36%. These imaging spectrometer derived physical parameters of fire temperature and fractional-area were found useful to the personnel making decisions on the ground. The complete set measurements, analyses, and results of this effort are reported in this paper. cosis.net



AVIRIS 2300-nm wavelength image of the World Trade Center disaster site acquired on the 16th of September 2001. nasa.gov
Additional thermal images from 09/16/01:
http://www.newyork.earthdata.com/images/thermal_sept162001_800.gif
http://s3.amazonaws.com/nasathermalimages/public/images/lq-map-therm1_800px.jpg loc.gov



VRML visualization of Ground Zero from several perspectives, with orthophotography and thermal data draped over a LIDAR 3D terrain model. Datasets were acquired by EarthData on September 17th. esri.com
([additional thermal image from 09/17/01](#))



AVIRIS false color images showing the core affected area around the World Trade Center extending from 5 to 12 days after the collapse... The image on the 18th is dark because of clouds which blocked sunlight but not light emitted by the fires. usgs.gov

Image from 09-16-01.usgs.gov

Image from 09-18-01.usgs.gov

Image from 09-23-01.usgs.gov

The [aerosol] plume detected by IKONOS on September 16 was much less intense and much darker than the plume of September 12, and the lofting is not as evident. All of these were consistent with the improved conditions on the collapse pile observed during rescue operations. informaworld.com

Hotspots			09/16/01				09/18/01				09/23/01				
Spectrum	Latitude	Longitude	MA [m ²]	T [° K]	T [° C]	T [° F]	A [m ²]	T [° K]	T [° C]	T [° F]	A [m ²]	T [° K]	T [° C]	T [° F]	A [m ²]
A (WTC7)	40° 42'47.18"	74° 00'41.43"	430	1003	730	1346	0.60	1003	730	1346	1.80	<453	<180	<356	-
B (WTC7)	40° 42'47.14"	74° 00'43.53"	120	833	560	1040	0.08	903	630	1166	2.40	<453	<180	<356	-
C	40° 42'42.89"	74° 00'48.88"	130	903	630	1166	0.80	603	330	626	0.60	<423	<150	<302	-
D	40° 42'41.99"	74° 00'46.94"	180	793	520	968	0.80	703	430	806	1.00	<453	<180	<356	-
E	40° 42'40.58"	74° 00'50.15"	130	713	440	824	0.40	<423	<150	<302	-	<423	<150	<302	-
F	40° 42'38.74"	74° 00'46.70"	930	703	430	806	0.40	803	530	986	1.30	<403	<130	<266	-
G	40° 42'39.94"	74° 00'45.37"	740	1023	750	1382	0.04	803	530	986	1.40	603	330	626	1.30
H	40° 42'38.60"	74° 00'43.51"	80	823	550	1022	0.08	<443	<170	<338	-	<443	<170	<338	-
I (WTC7)	40° 42'46.94"	74° 00'42.75"	230	903	630	1166	0.08	603	330	626	0.70	603	330	626	1.00

J	40° 42'37.68"	74° 00'44.91"	20	513	240	464	4.00	903	630	1166	1.10	<453	<180	<356	-
---	------------------	------------------	----	-----	-----	-----	------	-----	-----	------	------	------	------	------	---

Calibrated reflectance temperature measurements. Positions are estimated to be ±6m (18ft). T is temperature as the highest recorded in a 4m² pixel covering part of the pixel. MA is the total size of the area >130°C (266°F, 403°K) in m². A is the area in m² of the listed temperature. Temperatures listed as “<” are upper limits and represent no detection. Hot spot J grew to 60m² on September 18. [\(source ACS 919 p71\)](#)

AVIRIS images obtained from an airplane flying over the WTC complex were processed to indicate thermal hot spots, shown as bright red, orange, and yellow spots on the images to the left. The dark areas are shadows of buildings and other structures. The numbers show the original locations of Towers 1 and 2 in the WTC complex. The September 16, 2001 image (left) reveals a number of thermal hot spots in the region where the WTC buildings collapsed. Analysis of these data indicated temperatures greater than 800°F (orange pixels), with some areas reaching over 1300°F (yellow pixels). These results were released to emergency response agencies on September 18, 2001. By September 23 (right), most of these hot spots that were initially detected by AVIRIS had been eliminated or reduced in intensity. [usgs.gov](#)

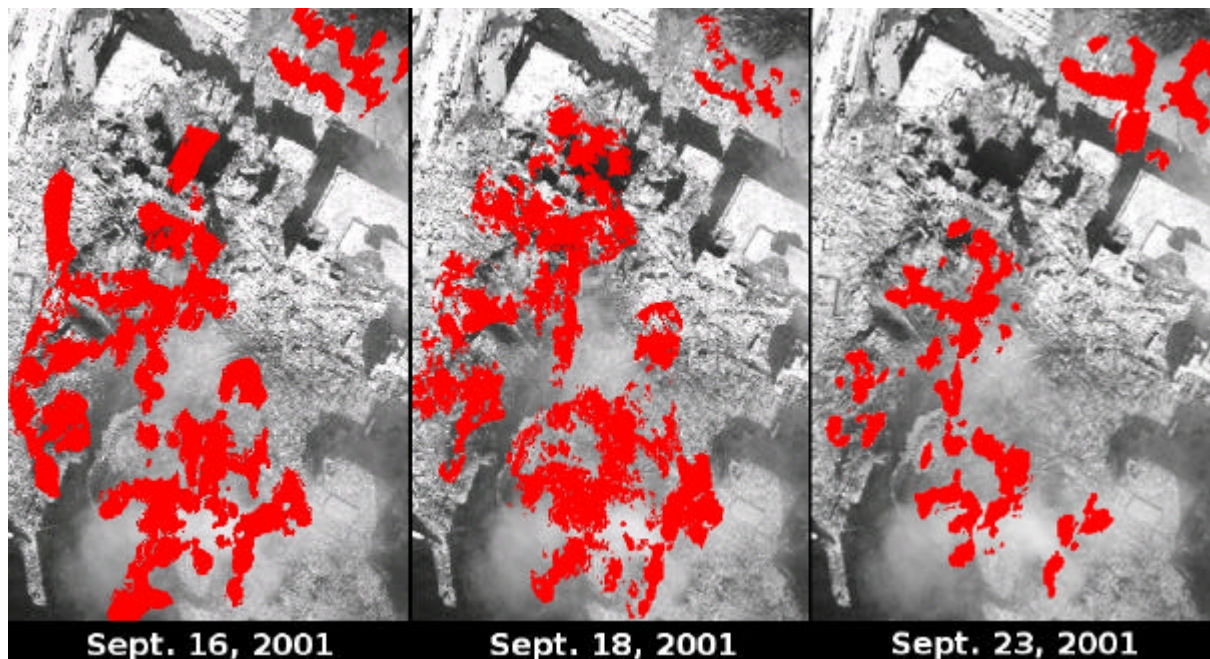
calibrated radiance temperature measurements

AVIRIS is also used to [estimate the temperature of volcanic vents](#).

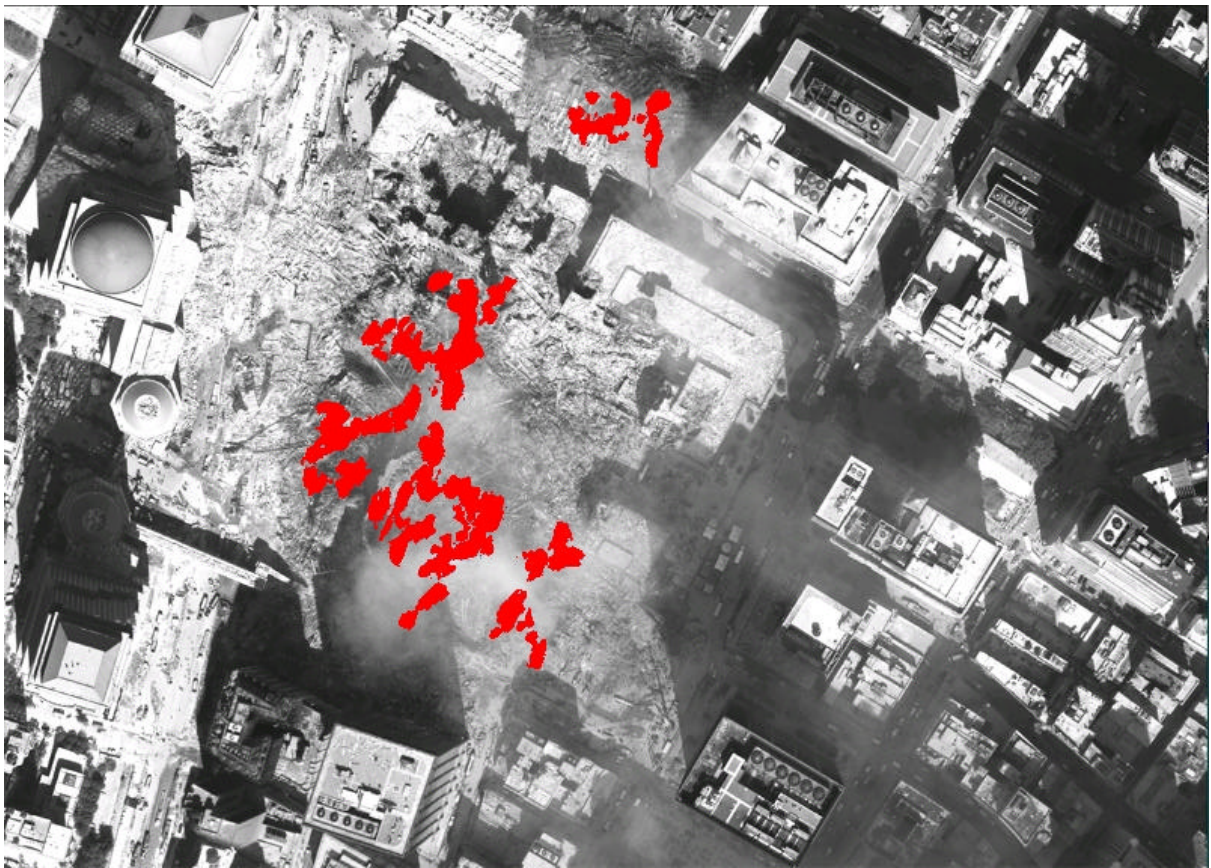
xXxXxXxXx Note: xXxXxXxXx

1. A total of 4 million gallons of water percolated through the debris in the first 10 days and collected at the bottom of the Bathtub. [linl.gov](#)
2. 2000 gallons of Pyrocool FEF (UV-blocking) foaming agent were sprayed on the "pile" starting 09/28/01. [newscientist.com](#)
3. Thermal data was acquired until at least 10/22/01 [\(source\)](#)
4. Thermal images presented below show that hot spots persisted well past 09/23/01. [fema.gov](#)

xXxXxXxXxXxXxXxXxXxXxXxXxXxXxXxXx

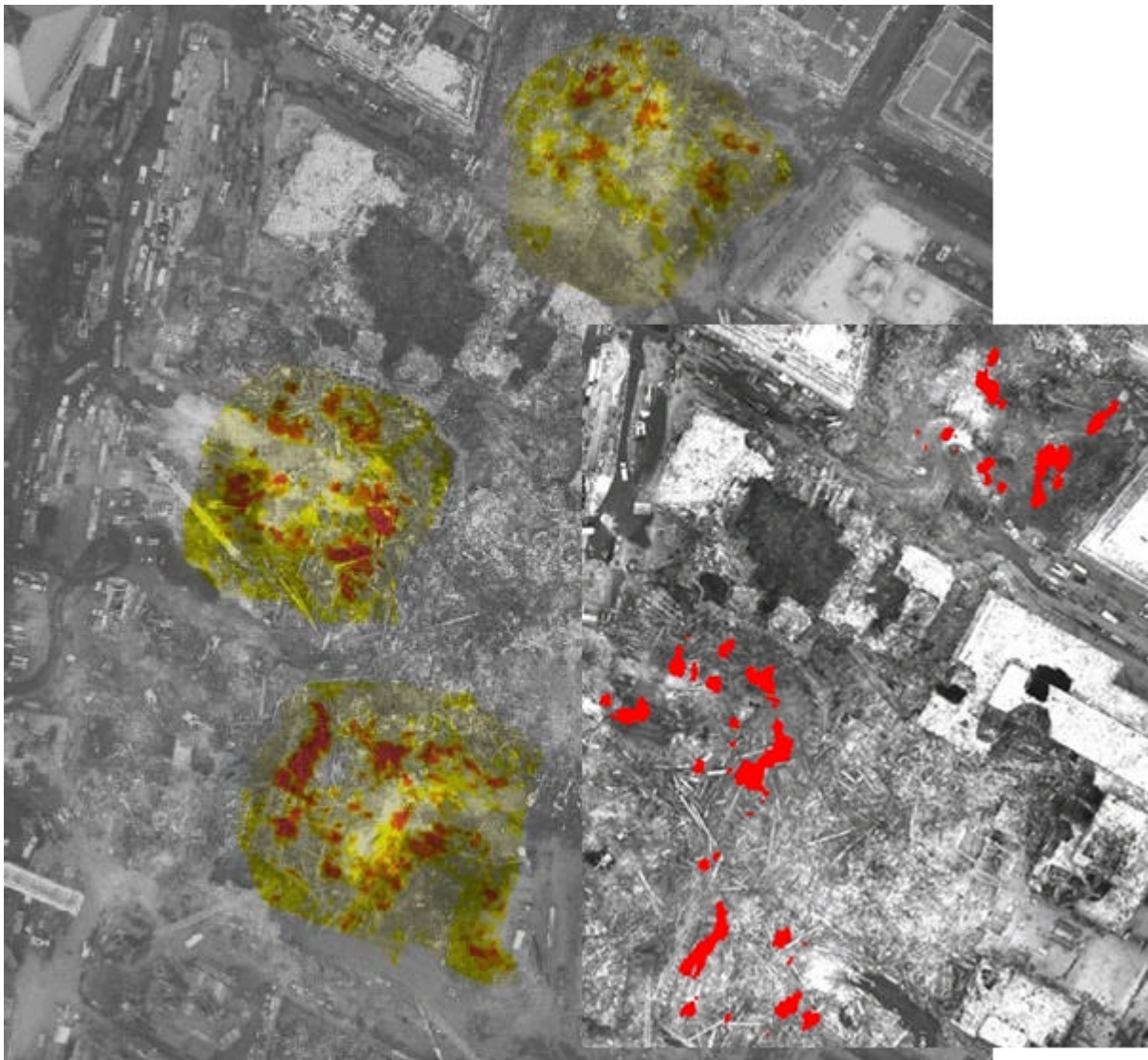


[earthdata.com](#)



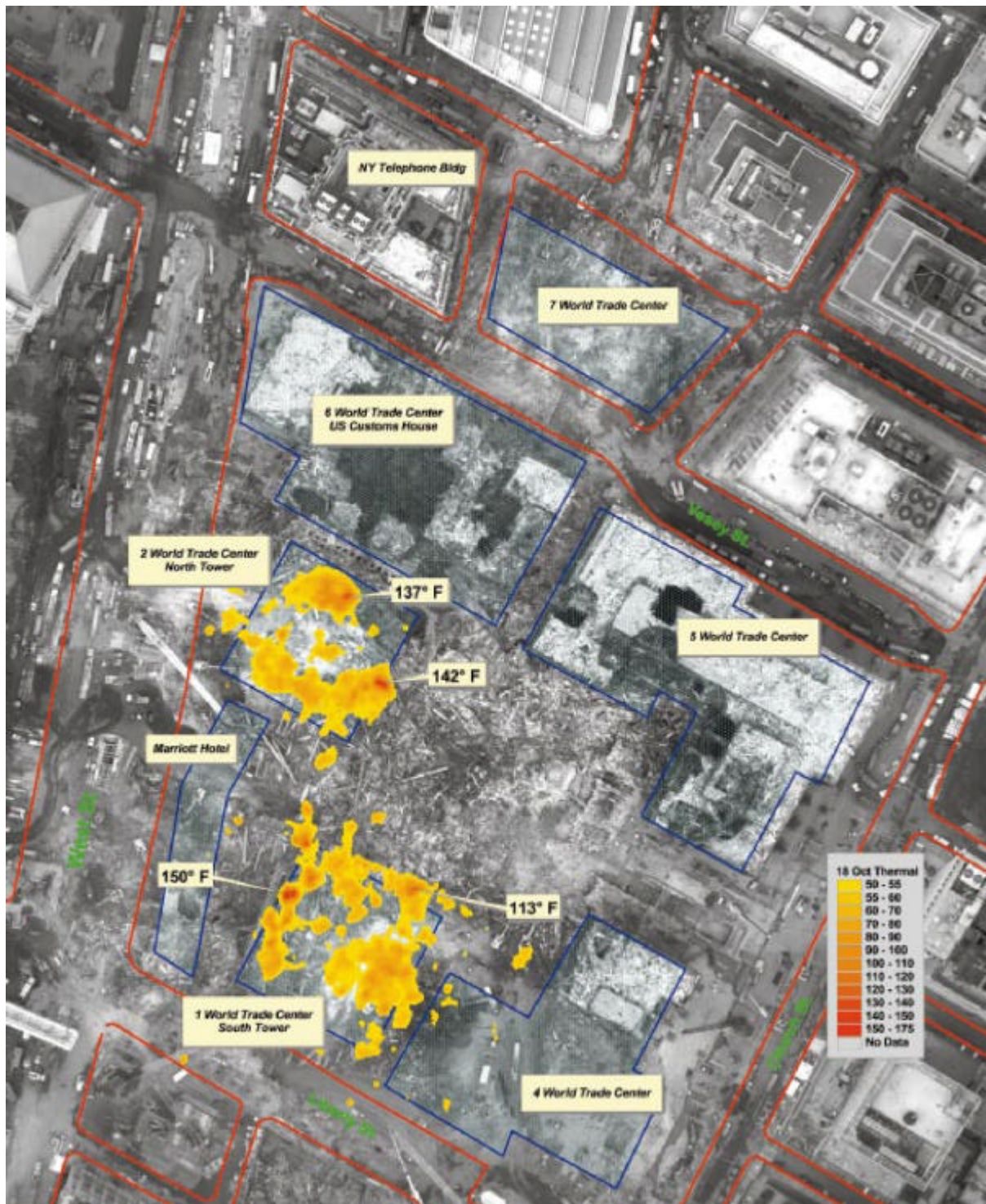
09/25/01 earthdata.com

Additional EarthData Thermal Images (in red)

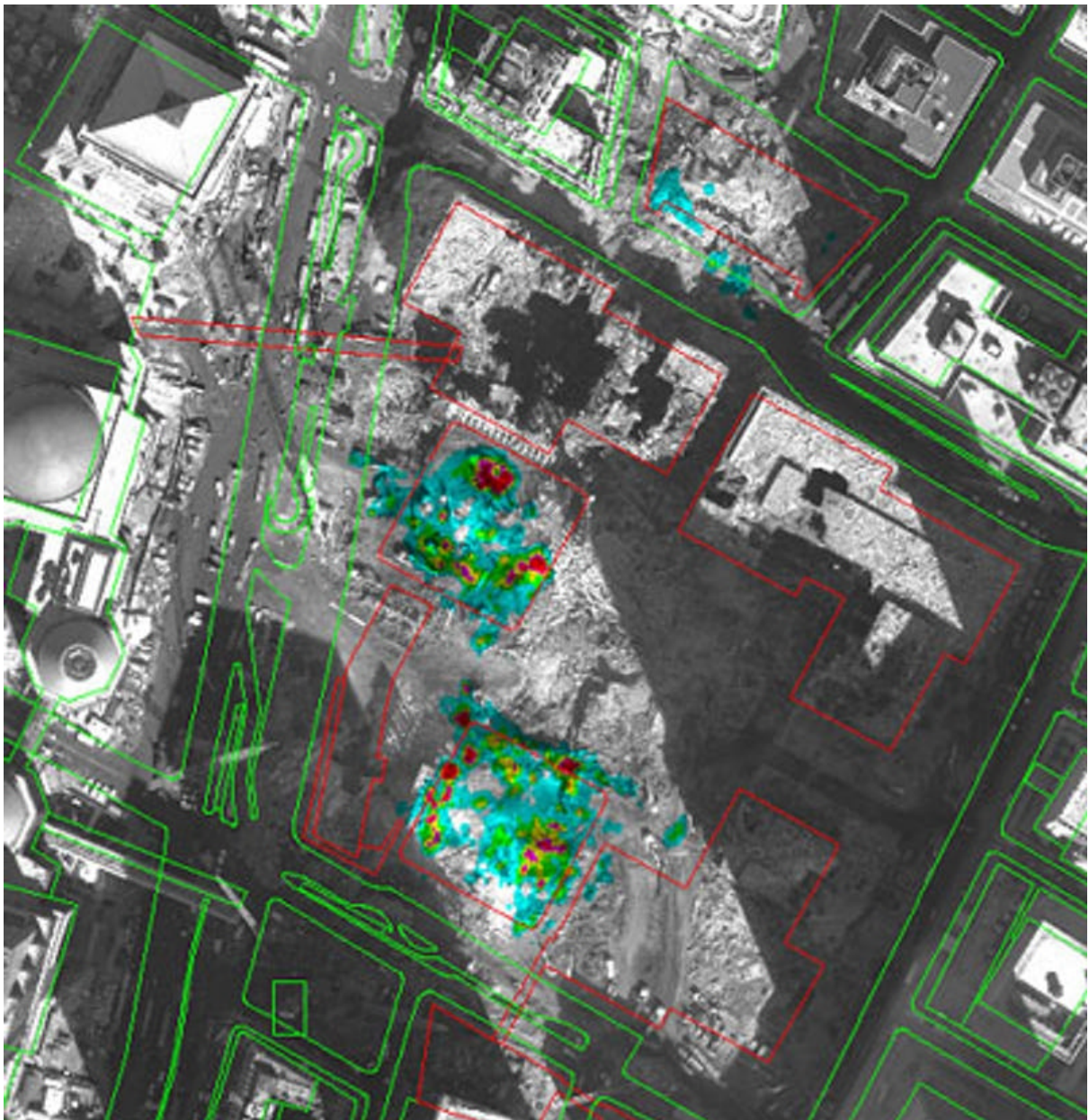


Thermal image of Ground Zero acquired by EarthData on October 7th using a Raytheon airborne sensor. The data are overlaid on an orthophotograph obtained on October 8th. Variations in temperature are evident across the site. However, these values were acquired (and are therefore displayed) using an 8-bit radiometric scale, rather than an absolute calibration such as degrees Fahrenheit. ([source](#))

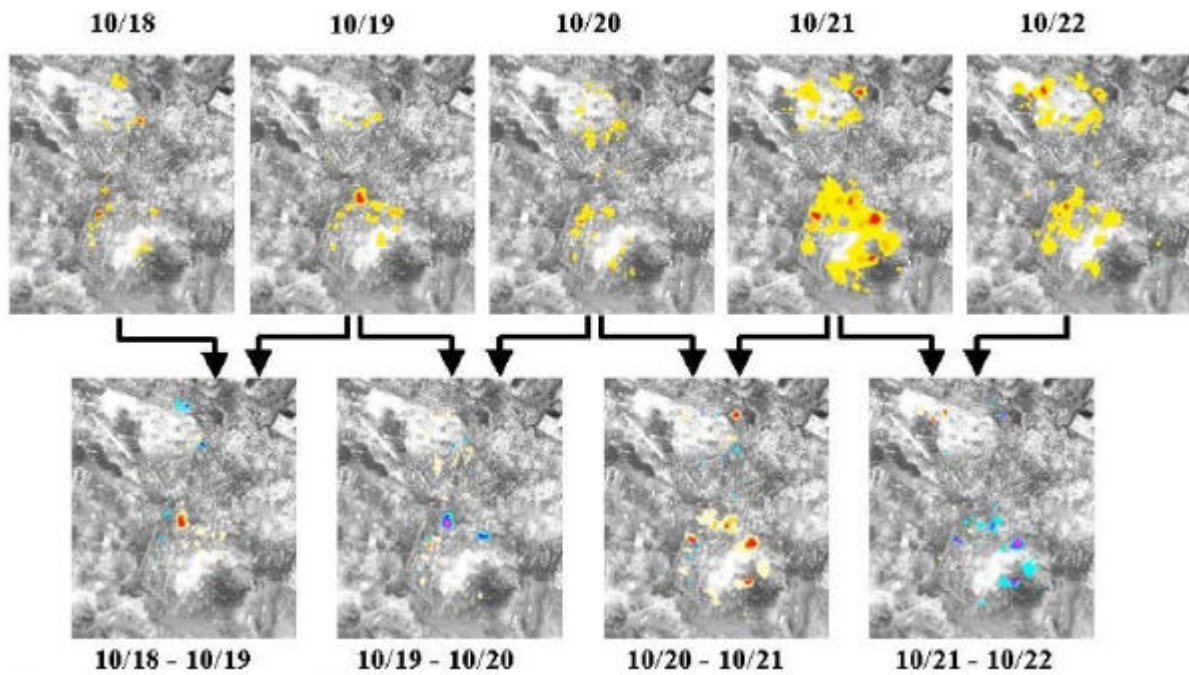
Sensor: [Raytheon Nightsight](#)
([inset_source](#))



Thermal data acquired by EarthData over the World Trade Center site on October 18, 2001, overlaid on digital orthophotography collected on October 7, 2001 with a Kodak Megaplug 16.8i camera. ([source](#))
 Sensor: [FLIR ThermaCAM PM 695](#), a radiometric thermal camera developed by FLIR Systems of North Billerica, Massachusetts ([source p4](#))
 Sensor: [FLIR ThermaCAM SC2000](#) ([gwu.edu p19](#))
 Where's the *WTC7* data?



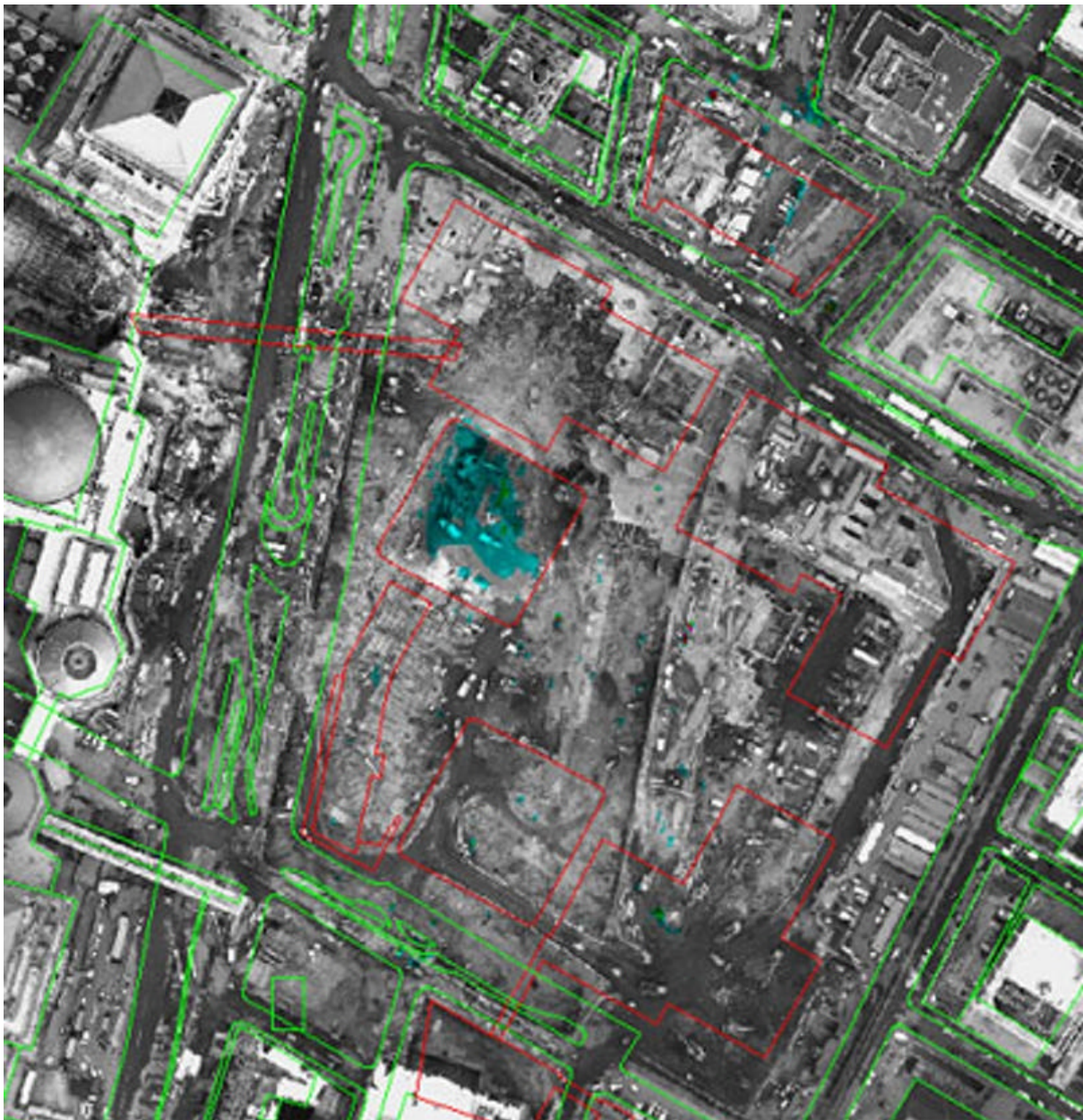
WTC – Thermal Imagery, October 18, 2001. New York State, Office for Technology (c2001) and EarthData International. loc.gov

Absolute Temperature (^oF)**Change in Temperature (^oF)**

The sequence of temperature readings on the top row of were acquired by EarthData between 18th-22nd October, using the FLIR thermal imaging device. They are overlaid here with the aerial orthophotography from October 7th. Notably, the thermal data are calibrated to record temperature in degrees Fahrenheit, thereby addressing the limitations of relative magnitudes acquired using the Raytheon sensor. The red areas correspond with temperatures exceeding 125F and the yellow class equates with temperatures from 75F to 125F . Values < 75oF are omitted.

Sensor: [FLIR ThermaCAM SC2000 \(esri.com\)](http://esri.com)

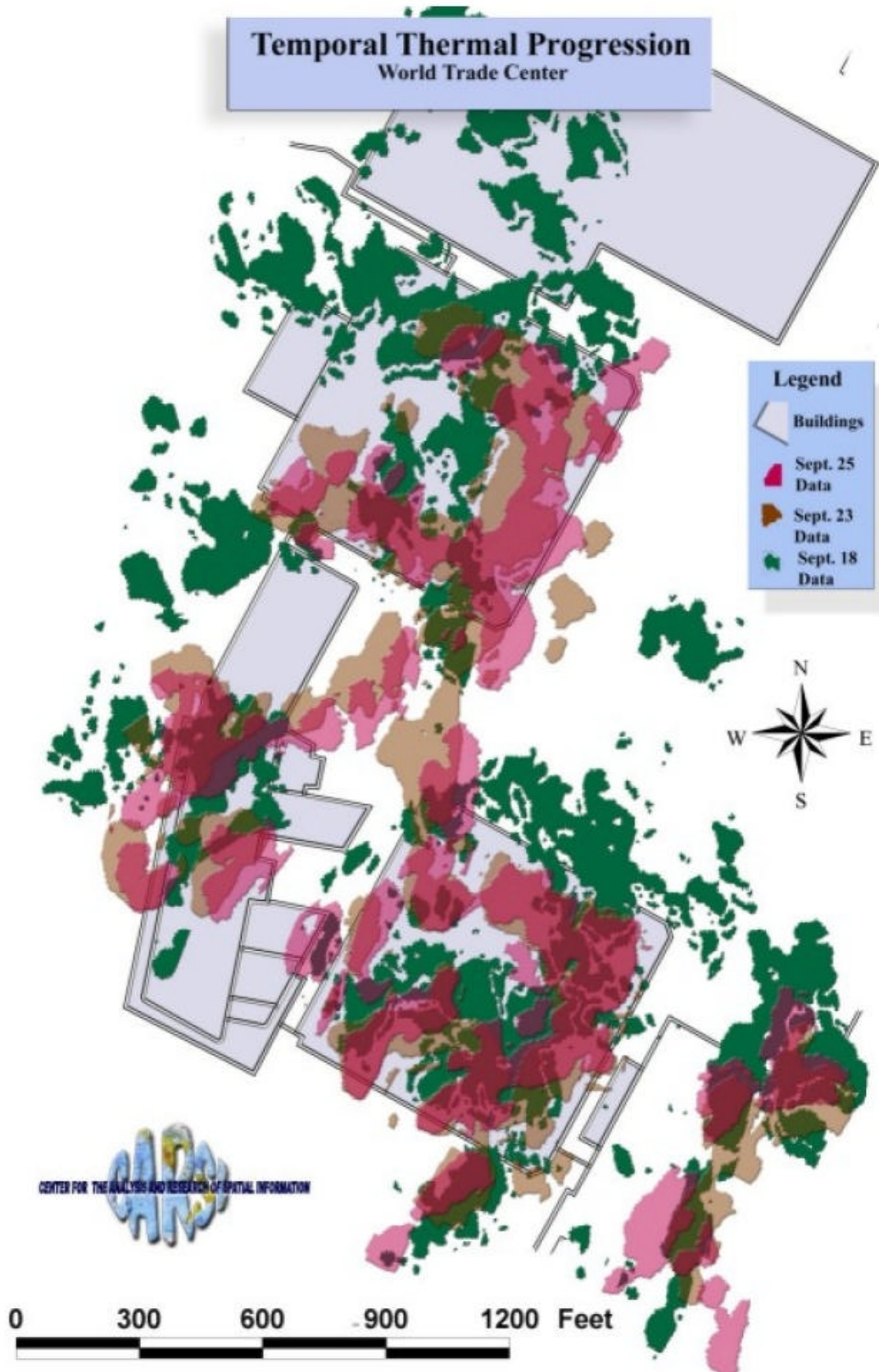
An overlay of the above image from 09-18-01 with the [corresponding AVIRIS image from 09-18-01](http://s3.amazonaws.com/nasathermalimages/public/images/09-18-01_FLIR_overlay_with_09-18-01_AVIRIS_and_visible_background_from_10-07-01.xcf) is available in [gimp\(xcf\)](http://s3.amazonaws.com/nasathermalimages/public/images/09-18-01_FLIR_overlay_with_09-18-01_AVIRIS_and_visible_background_from_10-07-01.xcf) format here: http://s3.amazonaws.com/nasathermalimages/public/images/09-18-01_FLIR_overlay_with_09-18-01_AVIRIS_and_visible_background_from_10-07-01.xcf



WTC – Thermal Imagery, February 12, 2002. New York State, Office for Technology (c2001) and EarthData International. [loc.gov](#)
[\(source\)](#)



These sprayers were also used to cool the high temperature debris before it left the site. Several trucks were returned to the site for additional cooling because the law enforcement officers would not let them through the tunnels leaving Manhattan until they stopped steaming. libertypost.org/army.mil

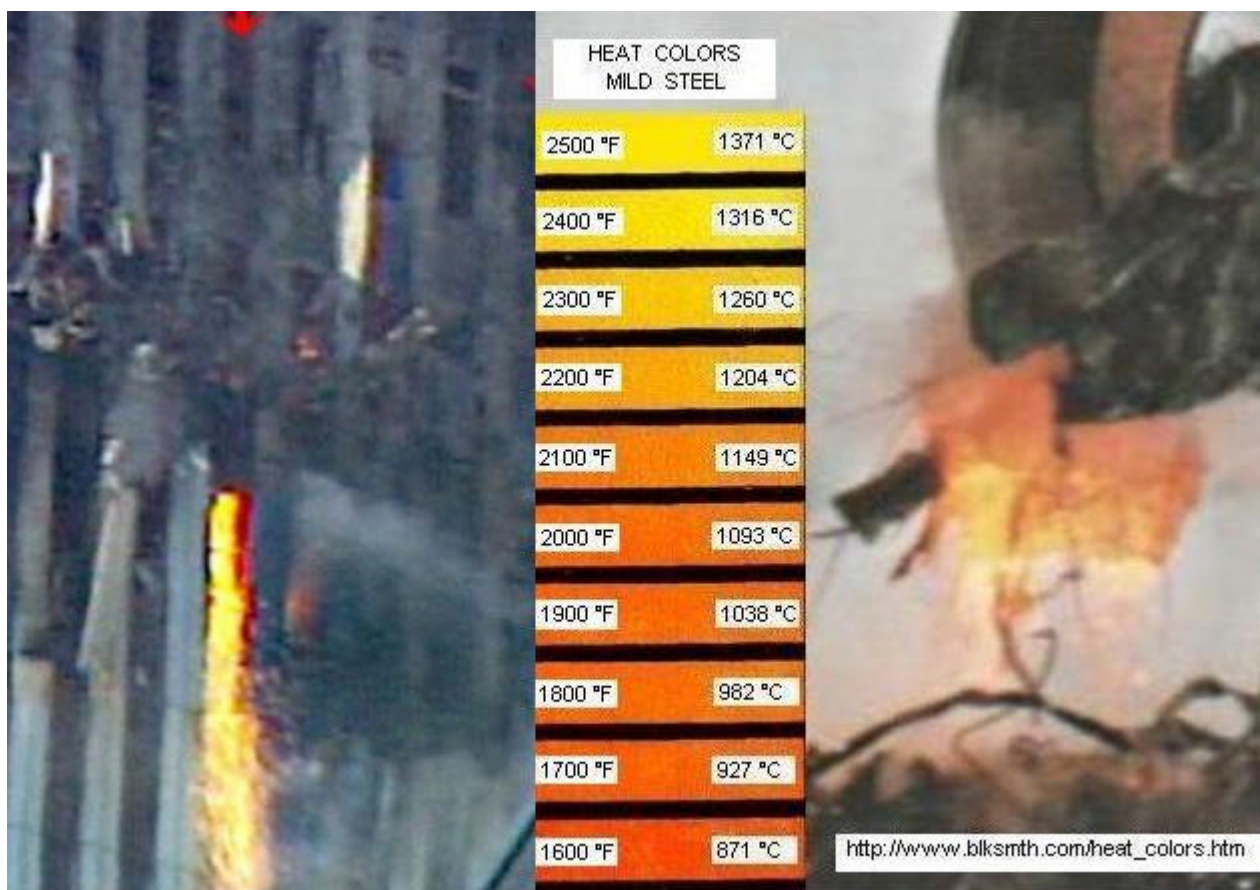


Thermal Imagery of the progression of molten steel hotspots from September 18 to September 25. Notice how the heat becomes concentrated towards the center from the fringe areas. The threshold between color ranges was 1/2 of the energy, so that in a range of 0-255, everything above 127.5 was kept (0-127.5) and everything below was ignored. -Maddalena Romano cuny.edu ([source2](#))

September 16—Thermal imagery measures the progression of underground heat on about a weekly

basis. These images are produced in 8-bit grayscale, with brightness levels of 0-255, 0 being the hottest and expressed as pure white. This is known as emissive data, or heat being given off from the structure from underlying hot debris or molten steel. Smoldering is yet undetectable, because potential fires appear cold until they are exposed to air. The first thermal images produced began on September 16, and are repeated on two day intervals. I would like to thank Jeff Bliss for the wonderful information and imagery he provided for this story, and acknowledge the 16-20 hours days CARSI Lab director Dr. Sean Ahearn has been putting in at the OEM. I would also like to credit Jeff Bliss, Constandinos Theophilides, and Bob Sklar for their tireless analysis. For a more in-depth look on CARSI, see the upcoming January special issue. cuny.edu

The gravitational potential energy of the collapse was capable of raising the entire mass of debris only a few degrees K. The largest energy sources available are the combustible materials present in the buildings and furnishings and a significant body of fuel, **especially under WTC #7**, in the form of diesel fuel for emergency electrical generators and large quantities of oil in various forms in the Consolidated Edison substation, also under WTC #7. Very high temperatures occurred in the burning floors of the buildings prior to collapse and during the first few days of active surface fires, as shown by the melting of metals. Later, infrared surveys showed surface temperatures in the collapse pile were as high as 30 K above ambient in October, and much higher subsurface temperatures were inferred from the lower portions of removed steel beams glowing red. The subsurface of the collapse piles remained hot for months despite use of massive amounts of water to cool them, with the last spontaneous surface fire occurring in mid-December. informaworld.com



<http://911blogger.com/node/12589>

[Additional WTC Hot Spot Information](#)

An extensive PDF containing this information and more is also available at:

http://www.911research.wtc7.net/papers/dreger/GroundZeroHeatAppendix2008_07_10.pdf

