

Èííëáëñíúá èññëääíîáíëý Âèðèñêîíî àíëëää

Èííëáëñíúá èññëääíîáíëý Âèðèñêîíî àíëëää. Æ.Ñ.Àíòëéí1, Æ.Í.Àðñáíòúáá2, Æ.Æ.Ñáíáíîá2, Ñ.Æ.Ëçáá2,31 Èííðëòòò ááíòëíë Æ.À.È-mail: uustar@star.isu.ru Comprehensive studies of the Vitim bolide V.S. Antipin1, A.N. Arsentiev2, D.V. Semenov2, and S.A. Yazev2,31 Institute of Geochemistry SB RAS, 2 Astronomical Observatory of Irkutsk State University, 3 Institute of Solar-Terrestrial Physics SD RAS Ðàçïá:

À íí-ù íà 25 ñáíòýáðý 2002 áíää íà ñáááðá Ëðëòòñêîíë íáëáñòë íáëëáëñý ýðëëë áíëëá, ñíðíáíæááðëñý ííúííë ñááòíáííë, à Æèòëñêîíë. Ñëëáíë èííðëòòòíá Ëðëòòñêîíë íáò-ííáí òáíòðá ÑÍ ÐÁÍ è Ëðëòòñêîíë áííòíëááðñòëòáà à 2002-2003 áá áúëë íðááíë íáúáëòëáííë ðááëñòðáòëë ðíýáëáíëë áíëëáá, íáñëááíáí ðáéíí ááíëü òðáññú íáááíëý, íðáááëáííë ñíòííëëáíë ÑÏÆ. Áúíëíáí áíá òðáññú ííëáðá. ðáñòëòú ñíááðæáò ìëíáðáëüíúá áññíòëáòëë, èíòíðúá áñòðá-áðòñý á íáòáíðëòííí ááúáñòáá (ñóëüòëáíúá è íáòá Áíòáðëòëáü; çáðíí, ñíááðæáúáá íëðëò; -áñòëòú, ñíááðæáúëá íëññëáííá è íáòáëëë-áñíëá æáëáçí, à òáëæá íëëáëñòíá æáëá íëëðí-áñòëòáë èááðòá íáíáðòæáíá à óáëáðíáëñòíí (ñáæëñòíí) íáòáðëáë. Ñííòííáíëý Ñí è Ñë ñííðááòñòáòòò òáðáëòáðíúí áëý ñíçááçáëë íáááñá. Ááíëü òðáññú ííëáðá íáëááíú ííæáñòááííúá ííðáðæááíëý èáñá íðááííëíáëòáëüíí áñëááñòáëá ááëñòáëý óáá

A bright bolide was sighted over the northeastern territory of the Irkutsk region in the night from September 24 to 25, 2002, which was accompanied by dramatic luminous, acoustic and electrophonic effects. Following our suggestion, it received the name Vitim bolide in the literature. A number of research institutes of the Irkutsk Scientific Center SB RAS, and Irkutsk State University organized three reconnaissance expeditions to the anticipated location of the bolide's explosion to carry out a relevant exploration. Eye-witnesses were polled, more exact data on the bolide's effects were collected, and the area along the falling route previously indicated by USA satellites was explored. An analysis was made of the cosmogenous substance particles collected by the second expedition (April 2003) in the snow in the presumable area where the bolide had fallen down. The particles contain mineral associations typical of meteorites (sulfide and metallic phases). The researchers found microspherules with porous structure resembling those sampled from the Antarctica's snow cover; grains containing pyrite, particles containing oxidized iron, and metallic iron, as well as nickel-containing iron containing from a few percent to several tens of percent of nickel. A particle of nickel-containing iron in association with a microparticle of quartz was found in carbonaceous (soot) material. The Ni/Fe ratios correspond to the minerals typical of meteorite material: tenite, and kamasite. The bolide's radiant was determined: right ascension 22 hours 18 minutes, and declination 10 degrees 02 minutes in the Pegasus Constellation. Multiple damage to trees were found along the flight path, perhaps caused by the shock wave. The high power of the phenomena accompanying the bolide seems to be associated with its high entry velocity into the atmosphere.

Áááááíëá À íí-ù íà 25 ñáíòýáðý 2002 áíää íà ñáááðí-áííòíëá Ëðëòòñêîíë íáëáñòë (íáíñëí-ðóëñëë è Áíááëáéíñëë ðáéííú, ááññ ñíðíáíæááðëñý- áëòñòë-áñëíë ýðáëòáíë è ííúííë áíçáóòííë áíëííë, áúçáááðáë ñíðòýñáíëý íá áíëüòëò ðáññòíýíëýò. Òðëíá ñ. èííðáéíáòáíë 57.910 ñ.ð. è 112.900á.á. Áíëëá íðíñëáæáí áí áúñíòú íëíëí 30 èí íáá òí-éíë Á ñ èííðáéíáòáíë 58.210 ñ.ð. è 113.460 íáëííá è áíðëçííóò (íðëíáðíí 340). Íáúáý áëéíá íðíáëòëë ðíýííë òðááëòíðëë íò òí-ëë Á áí òí-ëë Ñ íáðáñá-áíëý ñ çáíëáë ñííðááëë 58.600 ñ.ð. Ñíáëáñíí ñíòííëéíáíúí ááííúí, à áëáëííí áëáíáçííá íëë èíòáíñëáííñòë èçëò-áíëý. áíëëáá ðááíýëñý. 2.4 * 1011 Áàòò/ñòá ýëáëááëáíòíí áçðúáò 200 ò òðíðëëá. Èéíáðë-áñëáý- ýíáðáëý íá áòíáá à áòííñáðòò íòáíáá à 2300 ò òðíðëëá. Áíëëá íáááë áíííáñòáòòòò ááðòëí (áíëüòíá). Óáííáðáòòá áúëá íëíëí íóëý íí Óáëüñëð, ðáë íáëëëë áíæáü, à áíðáò - ñíáá. Áëóáéíá ñíáíá íëáçáëííú, çáëííáðáëòíááëë á ñëíá ñíááá áúíááòëá -áñòëòú èç áúííí-íüëááííáí ñëááá áíëëáá. Íáíë ðáññ-ëòáí ðááëáíó áíë èñííëüçíááíú áëý íòáíëë íðëíááëááííñòë Âèðèñêîíî àíëëáá è èáëííó-ëéáí íáòáíðííó íðíòëó, òíòý íðëááááííúá íëæá ááííúá í ñííòá. Âèòëñêîíë áíëëáá èç-áëñý íáñëíëüëëë ýéñíááëòëýíë. Íáðááý (íëòýáðú 2002 á.), íðááíëçíááíáý Èííðëòòòíí ñíëíá-íí-çáííë òëç òí-ëë Á áíëëáá è íðíñëá íëíëí 30 í-ááëáòáá. Áóíðáý ýéñíááëòëý (íáðò-áíðáëü 2003 á.), íðíáááíáíáý Èííðëòòòíí ááíòëíë áúííí-íüëááííáí ñëááá áíëëáá. Óðáòúý ýéñíááëòëý (èðëü-áááòñò 2003 á., ÈÁ ÑÍ ÐÁÍ, ÈÑÇÓ ÑÍ ÐÁÍ, ÁÍ ÈÁÓ è Èííðëòòò áá ýéñíááëòëýíë ÓðÁÓ (èðëü 2003 á.) è ÍÍ ÍÍ (èðëü 2003 è èðëü 2004 áá). Ðáçòëüòáòú ýéñíááëòëýííúò èññëááíáíëë ííóáëëéíáíí

Ááúáñòáí Âèòëñêîíî íáòáíðíëáá

Ááæíáëòëí èòíáíí íëááúò èññëááíáíëë á ðáéíá íáááíëý Âèòëñêîíî àíëëáá ý

íðëááááíú á [4-5]. Áëááííñòëá -áñòëò, íáíáðòæáííúò íá òëüòðáò, à òáëæá èññëááíáíëý èò íëíáðáëüííáí è òëíë-áñëíáí ñííò ñíáíáíáí íðëíáá ñ èñííëüçíááíëáí ýáëòòííáííáí íëðíñêîíëá ñ íëððíçííáíáíúí áíáëëçáòíðíí íëò-áíú ááííúá, ñáëááòáëüñòáòòòòèá í íðëí íáñëíëüéí -áñòëò æáëáçëñòúò ñíááëíáíëë - íëññëáííá è íáòáëëë-áñíëá æáëáçí, íëëáëñòíá æáëáçí. Íëðëò á áññíòëáòëë ñ áð òáñííðííòðáíáí è á çáííúò íðíááò ðáçëë-ííáí ááíáçëñá. Íáòáëëë-áñíëá æáëáçí òëðíéí íðááñòááëáíí á íáòáíðëòííí ááúáñòáá, íáíáë æáëáçëñòúò òáç íá íááëðááííí óðíáíá ñíááðæáíëë á íáòáëüíúò ñëó-áýò ñáíëñòááííí è íáòáíðëòííí ááúáñòáá. Á ýòíí íòííáíëë í íëíáðáëüíí èáíáñëòò è óýíëòò. Íëëáëñòíá æáëáçí á óíðíá èáíáñëòá áúëí íðááñòááëáíí 91,7-97,5 % è 2,5-8,3%, á óíðíá óýíëò ðáññ-ëòáíú íá 100%. Á èñòíáíúò áíáëëçáò íáðááòëá ñòííú ííæáò áúòú ñáýçáíá ñ íëññëáíëáí -áñòëò íðë ðáçòòóáíëë íáòáíðíëáá ááúáñòáá ááðüëòòòò è òëðíëòò íðáááëáò è áííëíá óéëááúááðòñý á óðíáíë èò èííóáíòðáòëë á ðáçëë-íúò íáòáíðëòáò [8]. Ýòí íí ñííòááò áðóííá áðííëéíëò-íñáááíáðòëëò. Áðííëéíëò íáðáíá-áëüíí áúë íáíáðòæáí á íáðáçóáò èóííúò íðíá è íáçááí á -áñòú áíá íòëë-ëá íò ííñëáííáí, á áðííëéíëòá -áñòú æáëáçá çáíáúáíá íáííëáí, è íí íá ñíááðæòò íëññíáí æáëáçá. Ñáíí íðëñòóñòáëá á èñ ñíááíáíáí íëðíáá Áíòáðëòëáü ñáëááòáëüñòáòáò í ááðíýòííí íáòáíðëòííí íðíñòíæááíëë ýòëò ñòáðóë. Ðýá íáñòíýòáëüñòá ááòëòíáëá íáðáçíááíëý èíòíðíáí ñííòááòñòáòáò óçëííó èíòáðááëò ááò ááëëçë ááòú íáááíëý áíëëáá, ííçáíëýáò íðááííëíáëòú, -òí ááëëçë íðíáëòëë òðáññú ííëáðá íáòáíðíëáá. Óíðíá ñòáðóë è òáðáëòáð èò ííááðòííñòë ííçáíëýòò ñ-ëòáòú, -òí ííë ííáëë áúíáñòú ò òëíë-íá áëý èíðáííúò íðíá íáíñëí-ðóëñêîíî ðáéííá. Áëüòáðíáòëáíúá áëííòáçú (òëíá ííáááíëý á ñááæëë ñíááíáíë íëðíá íá ááðòëí ðáñííëáííáí ááúáñòáá Âèòëñêîíî òáëá á ñíááíáíí íëðíáá ííëíí ñ-ëòáòú áíëüòíë íáò-ííë óáá-áë. Áíçááëñòáëá óáððíé áí òðáññú ííëáðá áíëëáá ó-áñòëë è ííëííú ñááæáñëííáííáí è ñááæáííááëáííáí èáñá ñ òáðáëòáðíúí íáñòòááíí á ñíòíë íáòðíá - èëëíí 2002 áíáá. Á íáëíòíðúò íáñòáò áíëý ííðáðæááííúò ááðááúáá ñííòááëýáò 10 - 15%. Ñíýòú íá óíòí- è áëááííëáíëó ááðáçú, èëñòáá íáëíòíðúò ñëó-áýò íòëíáííúá ááðòëíú ááðááúáá èáæáëë á 10-15 í ò íííáíáíëë. Ýòíò ýóðáëò íááëðááëñý è íá íòííñëòáëüíí ðíáíú ñáëááòáëüñòááí íáñòíúò æëòáëáé, íëëíááá ðáíáá íë-ááí ííáíáííáí çááñú íá íááëðááëííú. Áíëüòëííòáí ááðááúáá èáæëò ááðòëíá

Ιθαείουάναοάίίί άίεç ιί κέείίό. Δαάεαεύίαγ κόδοέοόδα κέίίίά ε άúααείά (ιαδόαό τó ιθίαέοέε οδάνηú ιθεάοα) ίά ίαάεπαάοηγ, ε άúκίείέ ιθί-ίίκóυρ κóεάίεεα). Çίίά, άάά ίαάεπαάοηγ ιίάδαάαίεγ εάηα, όγίαοηγ τó ιθαάίάί άάδαάα Άεοεία άίετóυ άί θαείίά όó- άúκίόυ 25 - 30 εί, ίά άίεαείά άúόó κóυάηοάάίίίε, ε ηάγçú ίαάαό άίείίε ε ίίίεάηοάίί ιθαεάίίúó ε ιίάδαάαίίúó άάδαάúάά άúαεγá άάδκέε κίόοίεείά (κίόδγηάεά ιθαάδίηέεί ίá-έó, ιίκóάα κί κóίεα ηάαεέεαηú ίά ιίε, εθίεúίεεά τóάδίηέεί τó κóάίεε άόάεε ίά άάδκó άάέεçε όι-έε Ά, ίάηιτόδγ ίά όι, -όί ίίε (ί-άάεάóú) ίαόίεεέηú ά άίεείά θαέε, γέδαίεθίάάίίίε άúκίεείε άίδαίε. Άίεúαγ ιίúί άείάίε-άηέείε ιθίόάηάίε θαçδóάίεγ ίάόάίθίεά. Έ κίεάεάίεθ, ά γóιι κέó-άά ιθόάάοηγ ίαεί θαίίίά ίαέοε έθóίίúά όδαάίάίόυ είι εάηάαόηγ άείτóαçú í ιίάδαάαίεγó εάηα ίαάαρυέίε όδαάίάίόάίε ίάόάίθίεά, όι, άηέε κέίιú τóάεεúίúó άάδóóάε άάδαάúάά ίάείί

Έ άίίθίόό í άίçίίεάίίε θαεείάεοέάίίηόε Άεοείηέίάί άίεεάα Νίεάηίί άαίίúι, ιίέó-άίίúι ίαίε ά Έθέόóηέιι ίαέαηóιι όίδαάε ιίηεάάίεά 10 εάó κίηόάάεγáó 13 ίεθ/-άη. Νόάάίάίáηγ-ίúά çía-άίεγ άάδúεόδóó ά ίόάάεάó τó 9 άί 16 ίεθ/-άη. Óάι ίά ίάίάά, ά ηά 25 ηάίόγáδγ 2002 άίάά ιίηέά ίι-ίúó ίαάεπαάίεε άίεεάά άρ άúε ιθίάάάί άίάίεάίάúε çáíáθ όθίάίγ θαεείάεοέάίίηόε. Ιίέó-άίίίά çía-άέεçίε ε ίάú-ίίε ίίθίá. Ιί τóεοεάεúίίίό κáεάάóάεúηόáó ε.ί. ίá-άεúίεεά ΑΙΝΑ ίαίá Ι.Α.Νúθίεάαθέί, τóάεεúίá εçíáθáίεγ όίίá ά θαάάέε-είό. Εçíáθáίεγ, ιθίάάάάίίúά κίόηόγ ίáηγó, 23-24 ίεόγáδγ ίάθáίε Άεοείηέίε γέηίάάεοέάε ά θαείίá όι-έε ιθόάθε άίεεάά ηάίιηάίόγáδγ 2002 άίάά ιίεάό ά ιθέίόείá ίáúγηίγóυηγ ιθé-είάίε, ίά ηάγçáίίúιε η όάίίáίίί άίεεάα. Νεάάóáó çáíáθéóú, -όί, άηέε άú ίά ίά ίάίάά, ίú η-εóάάι ίάίáθίάείúι óεαçáóú ίά γóτó θαέó ε άάάηόε άάί ά ίáó-ίúε ίάίθίó. Ν όι-έε çθáίεγ ηίáθáίáίίúó ιθάάηόάεάίεε, άáúάηόá θáηηάόδθéάáóóηγ εάε άίçίίεάίγ ιθé-είá θαçίáθáάά ίáάθ κίόόίεεά Ναóόθίá Υίόáεάά, άάά ίαάεπαάοηγ άίáγίúά άáεçá άίεεάά ιθόάάοηγ ίáγηίúι. Έ εó -εηέó τóιηέοηγ άίίθίí í ίáθáίεçíá άίçίέέίίáάίεγ ίáηηέθίááίίúó ιίáδαάαίεε εάηα άάίεú όδαάέόι Ν.Α., Έάáίίá Α.Α., Άίόέίεί Α.Ν., Άόθáίίá Ν.Α., ίεθé-έεί Ι.Α. Άεοείηέεé άίεεά: ίáηóιγáεúηόáά ίáάάίεγ ε θαçóεúóáóú εηηέάάίáά ιθίόάηηú ά ιθίάέάίá εηίε-άηέίε ιίáίáú». Έθέόóηé, 2003, Εçá-άί ΕΝÇÓ ΝÍ ΔΑÍ, Ν. 40-46. 2. Βçáá Ν.Α., Άίόέίεί Α.Ν. Ιί ηεάάáι Α. 66. 3. Βçáá Ν.Α., Άίόέίεί Α.Ν., ίεθé-έεί Ι.Α., Άόθáίίá Ν.Α., Έάáίίá Α.Α., Νάίáίίá Α.Α. Εηηέάάίáάίεγ Άεοείηέίáί άίεεάá. - Óθóáú Βçáá Ν.Α., Εόçúίέί Ι.Ε., Ιáθáίáéίá Α.Α., Άόθáίίá Ν.Α., ίεθé-έεί Ι.Α., Έάáίίá Α.Α. Ιθéθίáίúá γáεάίεγ ε άáúάηόáι ááεγóέίίίίáί ηεάá Άίόέίεί Α.Ν., Βçáá Ν.Α., Ιáθáίáéίá Α.Α., Άόθáίίá Ν.Α., ίεθé-έεί Ι.Α., Έάáίίá Α.Α., Ιáεείáá Ε.Α., Έάθίáίίá Ι.Ν. Óúáίίáηεáγ Ç.Ó. Άé 2005, ό. 46, 1 10, η. 1050-1064.6. Antipin V.S., Yazev S.A., Perepelov A. B. Efremov S.V. Mitichkin M.A. Ivanov A.V. Multi-purpose expedition research of the Vitim meteoroid fallen in September 2002 in Irkutsk region, Siberia. - Meteoroids-2004, Conference in Ontario, Canada, 16 -21 August, 2004.7. Βçáá Ν.Α., Άίόέίεί Α.Ν., Άίόέίεί Α.Ι. Άεοείηέεé άίεεά ιθόάάθéεáηγ ιθίáέáίú.- Εçáθáίίúά ιθίáέáίú áηóθίίίίε: ίáóáθéáéú ίáó-ιθáέó. Είίó. «Íááί ε Çáίεγ» (á. Έθέόóηé, 21-23 ίίγáδγ 2003. Νίáίόίáε- Α.Α., Νάίáίáίéί Α.Ι. Ιáóáίθéóίίá ááúάηόáι. Έεάá, Ιáóéίáá Άόίεá, 1984, 191 η.9. Άáóθééί Α.Α., Ιίηáá Ι.Ι., Θúáίίá Ρ.Ν., Έ 24.09.2002 á. - Άίεεάáú ΔΑÍ, 2004, ό. 397, 1 5, Ν. 685-688.10. χááίθáθáá Α.Α., Έτóáεúίεείá Ν.Ι., Άίáθááá Α.Ι. Ιίáγ εηίε-άηέεά 67-71.