

PHOTOELECTRIC OBSERVATIONS OF TT ARIETIS

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ABSTRACT. The photoelectric observations of the cataclysmic variable TT Ari, obtained at Kitt Peak National Observatory, at the Ostrowik Station of the Warsaw University Observatory and at the Skalnaté Pleso Observatory, are presented.

ФОТОЭЛЕКТРИЧЕСКИЕ НАБЛЮДЕНИЯ ТТ АРИ. Приведены фотоэлектрические наблюдения новоподобной звезды ТТ Ари получены на Национальной Обсерватории Кит Пик, на станции Островик обсерватории варшавского университета и на обсерватории Скалнате Плесс.

FOTOLEKTRICKÉ POZOROVANIA TT ARI. Publikujú sa fotoelektrické pozorovania novám podobnej hviezdy TT Ari získané na Národnom observatóriu Kitt Peak, Observatóriu Ostrowik Univerzity vo Varšave a na Observatóriu Skalnaté Pleso.

## 1. INTRODUCTION

In the course of a collaborative study of the cataclysmic variable TT Arietis, a number of photometric series were obtained. We have discussed the results of the investigation elsewhere (Semeniuk et al., 1987). Here we present our unpublished observations in extenso.

## 2. OBSERVATIONS

The observations are listed in Table 1. All observations are differential in the sense that  $\Delta m = m_{\text{var}} - m_{\text{comp}}$ . The comparison star was BD +14°336, except for the night of JD 2446328 when the star "c" of Mardirossian et al. (1980) was used. The particulars of observatories and the instrumentation used are listed below in the chronological order in which the observations were obtained.

The observations on JD 2443723-47 were obtained by A.S.C. in August 1978 with the 0.4 m, f/4 telescope of the Kitt Peak National Observatory. The observations are reduced to the standard UBV system. Although weather was usually bad at the beginning of each night, it improved gradually so that it was clear by the time of observation. Observations were made with a standard single-channel photon-counting photometer, and frequent sky and comparison-star readings were taken.

On JD 2446328 and 58, in September and October 1985, the observations were obtained by I.S. with the 0.6 m telescope of the Ostrowik Station of the Warsaw University Observatory. The DC analog recording, single-channel photometer of the Observatory was used. Each star observation was followed by sky reading, and the comparison star was measured every 10 mins on the average. The observations were made with a B filter and were left in the instrumental system. Weather was good during both observational series.

Journal of observations

J.D.	spectral region	m.e.	observatory
2440000+			
3723	violet	0 <sup>m</sup> .02	KPNO
3733	violet	0 <sup>m</sup> .02	KPNO
3745	blue	0 <sup>m</sup> .02	KPNO
3746	blue	0 <sup>m</sup> .02	KPNO
3747	blue	0 <sup>m</sup> .02	KPNO
6328	blue	0 <sup>m</sup> .005	Ostrowik
6358	blue	0 <sup>m</sup> .005	Ostrowik
6329	blue	0 <sup>m</sup> .005	Skalnaté Pleso
6359	blue	0 <sup>m</sup> .004	Skalnaté Pleso
6412	blue	0 <sup>m</sup> .004	Skalnaté Pleso

The observations of JD 2446329-412 were made in September-December 1985 by the staff of the Skalnaté Pleso Observatory with their 0.6/7.5 m telescope. The

telescope is equipped with a single-channel photon-counting photometer controlled by a microcomputer. A detailed description of the optical and mechanical parts and the properties of the photometric system can be found in Horák et al. (1976). A detailed description of the electronic part was published recently by Klocok et al. (1986). The observations were obtained with the standard B filter and were left in the instrumental system. The length of the pulse-counting interval was chosen to be 20 seconds. The comparison star was observed approximately every half hour and the check star was observed sporadically only. The observational conditions were good.

Table 1.

J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$
2443723.+		.8948	0.682	.9225	0.650	.9458	0.527
.8622	0.479	.8979	0.646	.9231	0.650	.9462	0.478
.8655	0.498	.8984	0.616	.9237	0.647	.9489	0.520
.8709	0.448	.8990	0.629	.9243	0.649	.9495	0.524
.8714	0.496	.8996	0.650	.9248	0.669	.9501	0.503
.8720	0.521	.9001	0.649	.9254	0.674	.9506	0.488
.8726	0.549	.9007	0.679	.9260	0.663	.9512	0.488
.8732	0.582	.9031	0.654	.9265	0.662	.9517	0.549
.8738	0.617	.9037	0.674	.9271	0.637	.9523	0.536
.8767	0.548	.9043	0.690	.9276	0.665	.9530	0.540
.8773	0.546	.9046	0.688	.9308	0.574	.9536	0.513
.8778	0.512	.9065	0.677	.9314	0.583	.9542	0.512
.8784	0.540	.9070	0.663	.9320	0.630	.9548	0.494
.8792	0.545	.9076	0.663	.9327	0.669	.9553	0.472
.8797	0.537	.9082	0.622	.9332	0.678	.9557	0.482
.8827	0.607	.9085	0.610	.9338	0.656	.9585	0.397
.8832	0.599	.9109	0.644	.9344	0.667	.9590	0.423
.8838	0.601	.9115	0.646	.9349	0.654	.9596	0.456
.8844	0.601	.9120	0.655	.9354	0.638	.9602	0.451
.8849	0.591	.9126	0.657	.9385	0.612	.9607	0.466
.8855	0.586	.9132	0.649	.9391	0.620	.9613	0.467
.8860	0.588	.9137	0.664	.9397	0.630	.9618	0.473
.8890	0.588	.9143	0.676	.9402	0.623	.9623	0.497
.8896	0.597	.9148	0.671	.9408	0.661	.9633	0.514
.8902	0.582	.9154	0.676	.9413	0.668	.9639	0.530
.8908	0.607	.9160	0.682	.9419	0.652	.9645	0.470
.8913	0.620	.9165	0.692	.9425	0.675	.9650	0.445
.8920	0.632	.9171	0.671	.9430	0.634	.9656	0.428
.8926	0.596	.9203	0.632	.9436	0.623	.9661	0.403
.8931	0.630	.9208	0.605	.9442	0.628	.9666	0.363
.8937	0.646	.9214	0.587	.9447	0.567	.9685	0.422
.8943	0.683	.9220	0.626	.9453	0.544	.9689	0.429

Table 1. - continued

J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$
.9716	0.480	.8754	0.608	.9232	0.507	.9524	0.628
.9722	0.459	.8759	0.606	.9263	0.512	.9529	0.617
.9727	0.466	.8763	0.623	.9268	0.490	.9534	0.585
.9733	0.468	.8772	0.659	.9273	0.502	.9539	0.575
.9736	0.487	.8777	0.683	.9279	0.518	.9545	0.579
.9744	0.505	.8782	0.681	.9282	0.539	.9550	0.591
.9750	0.507	.8787	0.646	.9318	0.554	.9555	0.552
.9755	0.501	.8793	0.602	.9323	0.569	.9560	0.551
.9766	0.530	.8798	0.580	.9328	0.579	.9565	0.561
.9771	0.539	.8803	0.566	.9334	0.582	.9570	0.528
		.8808	0.563	.9339	0.576	.9575	0.504
2443733.+		.8813	0.576	.9344	0.580	.9581	0.534
.8588	0.692	.8818	0.580	.9349	0.582	.9586	0.594
.8594	0.704	.8823	0.593	.9354	0.584	.9589	0.615
.8599	0.692	.8829	0.594	.9359	0.571	.9596	0.618
.8604	0.683	.8832	0.599	.9364	0.573	.9601	0.618
.8609	0.674	.8874	0.693	.9370	0.533	.9606	0.622
.8614	0.677	.8879	0.691	.9375	0.513	.9611	0.627
.8619	0.683	.8884	0.693	.9390	0.441	.9617	0.624
.8624	0.674	.8890	0.692	.9396	0.437	.9622	0.606
.8629	0.698	.8894	0.687	.9401	0.466	.9627	0.599
.8635	0.716	.8899	0.699	.9406	0.447	.9632	0.586
.8640	0.723	.8905	0.697	.9411	0.455	.9637	0.582
.8645	0.724	.8910	0.718	.9416	0.488	.9642	0.569
.8650	0.696	.8915	0.708	.9421	0.476	.9647	0.551
.8655	0.670	.8920	0.699	.9426	0.484	.9653	0.534
.8660	0.672	.8926	0.691	.9431	0.498	.9658	0.531
.8665	0.662	.8931	0.683	.9437	0.492	.9663	0.508
.8671	0.669	.8936	0.726	.9442	0.523	.9667	0.520
.8676	0.652	.8941	0.725	.9447	0.538	.9673	0.547
.8681	0.646	.8946	0.741	.9452	0.544	.9678	0.544
.8686	0.632	.9055	0.609	.9457	0.561	.9683	0.542
.8689	0.648	.9060	0.575	.9462	0.587	.9688	0.564
.8698	0.648	.9065	0.593	.9467	0.581	.9694	0.588
.8703	0.660	.9070	0.653	.9473	0.593	.9699	0.609
.8708	0.650	.9075	0.666	.9478	0.598	.9704	0.623
.8713	0.637	.9080	0.610	.9483	0.582	.9712	0.634
.8718	0.634	.9086	0.616	.9488	0.592	.9718	0.618
.8723	0.642	.9091	0.571	.9493	0.606	.9723	0.618
.8728	0.632	.9096	0.626	.9498	0.593	.9728	0.623
.8734	0.604	.9213	0.486	.9503	0.591	.9733	0.628
.8739	0.616	.9218	0.465	.9508	0.605	.9739	0.641
.8743	0.633	.9223	0.438	.9514	0.613	.9744	0.652
.8749	0.627	.9228	0.461	.9519	0.617	.9749	0.655

Table 1.- continued

J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$	J.D. hel	$\Delta U$
.9754	0.674	.9780	0.705	.9807	0.721	.9832	0.644
.9759	0.677	.9785	0.725	.9812	0.689	.9837	0.619
.9764	0.697	.9789	0.722	.9817	0.663	.9842	0.626
.9769	0.698	.9796	0.728	.9822	0.661		
.9775	0.707	.9801	0.726	.9827	0.660		
	$\Delta B$		$\Delta B$		$\Delta B$		$\Delta B$
2443745.+		.9843	1.565	.9453	1.555	.9699	1.630
.9616	1.649	.9849	1.566	.9459	1.560	.9705	1.627
.9622	1.623	.9854	1.550	.9464	1.556	.9710	1.619
.9625	1.615	.9860	1.539	.9470	1.562	.9716	1.630
.9634	1.654	.9871	1.519	.9476	1.580	.9721	1.654
.9640	1.656	.9877	1.545	.9481	1.577	.9727	1.664
.9644	1.672	.9882	1.534	.9487	1.575	.9733	1.673
.9653	1.669	.9888	1.515	.9492	1.569	.9743	1.648
.9658	1.678	.9894	1.517	.9498	1.574	.9749	1.654
.9664	1.677	.9897	1.530	.9504	1.569	.9755	1.648
.9669	1.659	.9906	1.564	.9509	1.545	.9761	1.643
.9675	1.674	.9912	1.571	.9515	1.540	.9766	1.612
.9681	1.702	.9918	1.551	.9526	1.513	.9772	1.617
.9684	1.693	.9923	1.552	.9532	1.529	.9777	1.636
.9692	1.721	.9929	1.518	.9537	1.549	.9783	1.644
.9697	1.728	.9940	1.427	.9543	1.542	.9789	1.652
.9703	1.719	.9946	1.500	.9548	1.547	.9794	1.665
.9709	1.732	.9951	1.501	.9554	1.571	.9798	1.654
.9714	1.747	.9957	1.502	.9560	1.576	.9808	1.647
.9719	1.733	.9962	1.534	.9565	1.552	.9814	1.616
.9730	1.721	.9967	1.562	.9571	1.557	.9819	1.625
.9735	1.718	.9974	1.546	.9576	1.581	.9825	1.626
.9741	1.700	.9999	1.613	.9582	1.556	.9831	1.640
.9746	1.699			.9593	1.607	.9836	1.664
.9752	1.692	2443746.+		.9599	1.609	.9840	1.683
.9757	1.689	.0005	1.621	.9605	1.603	.9849	1.718
.9767	1.675	.0010	1.624	.9610	1.590	.9855	1.697
.9773	1.660	.0016	1.625	.9616	1.582	.9860	1.682
.9779	1.633	.0022	1.637	.9621	1.604	.9866	1.693
.9784	1.613	.0026	1.618	.9627	1.597	.9871	1.690
.9790	1.600	.0037	1.656	.9633	1.601	.9877	1.681
.9793	1.584	.0043	1.660	.9638	1.621	.9882	1.689
.9815	1.578	.0048	1.635	.9644	1.634	.9886	1.691
.9821	1.562	.0054	1.614	.9649	1.628	.9895	1.660
.9826	1.561	.0059	1.565	.9655	1.621	.9901	1.671
.9832	1.549	.0065	1.513	.9688	1.631	.9906	1.677
.9838	1.544	.0069	1.491	.9693	1.632	.9912	1.680

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.9917	1.702	.3681	-0.888	.4115	-0.817	.4486	-0.833
.9927	1.695	.3715	-0.771	.4119	-0.830	.4491	-0.833
.9933	1.705	.3719	-0.793	.4139	-0.837	.4496	-0.821
.9939	1.681	.3724	-0.799	.4143	-0.859	.4516	-0.804
.9944	1.683	.3750	-0.756	.4148	-0.882	.4520	-0.786
.9950	1.685	.3754	-0.750	.4178	-0.845	.4525	-0.773
.9961	1.718	.3759	-0.773	.4182	-0.834	.4532	-0.763
.9967	1.733	.3766	-0.716	.4187	-0.846	.4543	-0.750
.9972	1.740	.3771	-0.732	.4209	-0.854	.4548	-0.755
.9978	1.723	.3776	-0.745	.4214	-0.875	.4547	-0.771
.9983	1.729	.3804	-0.804	.4219	-0.883	.4551	-0.776
.9987	1.779	.3809	-0.787	.4228	-0.872	.4556	-0.766
.9996	1.783	.3813	-0.758	.4232	-0.895	.4577	-0.853
		.3818	-0.743	.4237	-0.876	.4582	-0.841
2443747.+		.3822	-0.694	.4257	-0.889	.4586	-0.835
.0002	1.772	.3827	-0.683	.4261	-0.902	.4592	-0.854
.0007	1.792	.3834	-0.686	.4266	-0.886	.4597	-0.851
.0013	1.789	.3839	-0.658	.4292	-0.819	.4602	-0.836
.0018	1.773	.3844	-0.708	.4296	-0.824	.4608	-0.827
.0024	1.759	.3880	-0.858	.4301	-0.837	.4612	-0.840
.0028	1.758	.3885	-0.854	.4305	-0.806	.4617	-0.853
.0037	1.748	.3889	-0.840	.4310	-0.797	.4643	-0.814
.0042	1.718	.3915	-0.840	.4315	-0.817	.4648	-0.828
.0048	1.689	.3919	-0.844	.4341	-0.791	.4659	-0.848
.0051	1.677	.3924	-0.830	.4346	-0.804	.4663	-0.833
		.3933	-0.802	.4351	-0.827	.4668	-0.829
2446328.+		.3938	-0.806	.4361	-0.806	.4672	-0.838
.3540	-0.740	.3842	-0.849	.4366	-0.795	.4677	-0.845
.3545	-0.731	.3968	-0.879	.4370	-0.798	.4682	-0.848
.3550	-0.715	.3972	-0.887	.4375	-0.791	.4688	-0.828
.3554	-0.725	.3977	-0.894	.4379	-0.823	.4693	-0.812
.3559	-0.740	.4001	-0.916	.4384	-0.820	.4697	-0.817
.3564	-0.739	.4006	-0.920	.4409	-0.799	.4724	-0.781
.3589	-0.782	.4011	-0.942	.4414	-0.782	.4728	-0.818
.3594	-0.686	.4041	-0.856	.4419	-0.786	.4733	-0.816
.3599	-0.674	.4046	-0.828	.4422	-0.758	.4743	-0.769
.3605	-0.699	.4051	-0.826	.4426	-0.755	.4747	-0.759
.3610	-0.702	.4056	-0.838	.4431	-0.754	.4752	-0.733
.3615	-0.699	.4060	-0.847	.4457	-0.810	.4756	-0.744
.3645	-0.806	.4065	-0.844	.4461	-0.800	.4761	-0.766
.3649	-0.789	.4092	-0.840	.4466	-0.814	.4765	-0.795
.3654	-0.799	.4097	-0.819	.4470	-0.838	.4787	-0.762
.3672	-0.854	.4101	-0.814	.4475	-0.803	.4792	-0.760
.3677	-0.910	.4110	-0.798	.4480	-0.797	.4797	-0.755

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.4806	-0.767	.5108	-0.827	.5413	-0.969	.5708	-0.830
.4810	-0.780	.5115	-0.842	.5418	-0.943	.5736	-0.908
.4822	-0.773	.5120	-0.857	.5425	-0.944	.5740	-0.905
.4819	-0.766	.5124	-0.828	.5429	-0.965	.5745	-0.897
.4823	-0.757	.5150	-0.819	.5434	-0.964	.5752	-0.936
.4828	-0.751	.5154	-0.837	.5440	-0.988	.5756	-0.943
.4855	-0.781	.5159	-0.849	.5445	-1.013	.5761	-0.926
.4852	-0.783	.5167	-0.855	.5450	-1.019	.5768	-0.913
.4864	-0.760	.5171	-0.846	.5473	-0.932	.5772	-0.916
.4870	-0.793	.5176	-0.835	.5478	-0.933	.5777	-0.911
.4875	-0.798	.5184	-0.830	.5482	-0.923	.5785	-0.835
.4880	-0.820	.5189	-0.849	.5489	-0.929	.5789	-0.848
.4888	-0.828	.5193	-0.868	.5494	-0.916	.5794	-0.852
.4893	-0.822	.5200	-0.881	.5499	-0.902	.5801	-0.846
.4897	-0.817	.5204	-0.898	.5506	-0.892	.5826	-0.834
.4919	-0.822	.5209	-0.916	.5510	-0.906	.5831	-0.845
.4924	-0.829	.5215	-0.943	.5515	-0.901	.5836	-0.881
.4929	-0.804	.5219	-0.918	.5542	-0.966	.5843	-0.837
.4936	-0.821	.5224	-0.904	.5547	-1.011	.5848	-0.833
.4941	-0.825	.5249	-0.981	.5552	-0.997	.5952	-0.810
.4945	-0.849	.5253	-0.967	.5559	-1.025	.5860	-0.785
.4951	-0.855	.5258	-0.964	.5564	-1.030	.5865	-0.803
.4956	-0.843	.5266	-0.938	.5568	-1.000	.5870	-0.767
.4961	-0.839	.5270	-0.916	.5576	-0.913	.5878	-0.758
.4986	-0.855	.5275	-0.918	.5580	-0.868	.5882	-0.757
.4990	-0.849	.5281	-0.927	.5585	-0.869	.5887	-0.754
.4995	-0.833	.5285	-0.913	.5591	-0.874	.5893	-0.810
.5003	-0.837	.5290	-0.890	.5596	-0.854	.5897	-0.814
.5007	-0.806	.5313	-0.943	.5600	-0.879	.5902	-0.772
.5012	-0.793	.5318	-0.975	.5607	-0.888	.5930	-0.849
.5018	-0.762	.5322	-0.975	.5612	-0.865	.5934	-0.861
.5023	-0.770	.5327	-0.955	.5616	-0.890	.5939	-0.787
.5028	-0.776	.5332	-0.955	.5643	-0.835	.5946	-0.772
.5034	-0.771	.5337	-0.968	.5647	-0.827	.5951	-0.775
.5039	-0.747	.5344	-0.940	.5652	-0.832	.5955	-0.776
.5043	-0.751	.5348	-0.946	.5661	-0.844	.5960	-0.775
.5068	-0.792	.5353	-0.963	.5665	-0.858	.5968	-0.764
.5072	-0.791	.5360	-0.920	.5670	-0.877	.5973	-0.777
.5077	-0.782	.5365	-0.920	.5678	-0.908	.5978	-0.764
.5083	-0.820	.5369	-0.918	.5682	-0.935	.5985	-0.751
.5088	-0.814	.5392	-0.944	.5687	-0.929	.5990	-0.723
.5092	-0.793	.5397	-0.956	.5693	-0.921	.5994	-0.747
.5099	-0.821	.5401	-0.982	.5698	-0.875	.6020	-0.806
.5103	-0.837	.5408	-0.984	.5703	-0.845	.6025	-0.838

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.6029	-0.824	.3369	1.578	.3595	1.636	.3833	1.673
.6040	-0.792	.3373	1.591	.3598	1.644	.3837	1.665
.6044	-0.780	.3376	1.572	.3602	1.646	.3840	1.644
.6049	-0.756	.3402	1.591	.3622	1.611	.3845	1.623
.6055	-0.729	.3406	1.595	.3625	1.624	.3849	1.592
.6060	-0.737	.3409	1.601	.3629	1.648	.3852	1.592
.6064	-0.741	.3413	1.614	.3632	1.661	.3856	1.590
.6073	-0.733	.3418	1.595	.3637	1.705	.3861	1.612
.6077	-0.711	.3422	1.597	.3640	1.700	.3864	1.622
.6082	-0.699	.3425	1.605	.3644	1.726	.3868	1.625
		.3429	1.589	.3647	1.713	.3871	1.608
2446358.+		.3434	1.585	.3652	1.717	.3873	1.587
.3204	1.630	.3438	1.591	.3655	1.713	.3876	1.596
.3208	1.597	.3441	1.617	.3659	1.712	.3879	1.599
.3211	1.585	.3445	1.640	.3662	1.726	.3883	1.587
.3214	1.566	.3467	1.609	.3683	1.668	.3908	1.563
.3221	1.536	.3470	1.580	.3686	1.689	.3912	1.601
.3225	1.548	.3474	1.601	.3689	1.653	.3915	1.617
.3228	1.530	.3477	1.590	.3693	1.648	.3918	1.607
.3232	1.521	.3483	1.558	.3698	1.644	.3924	1.549
.3236	1.563	.3486	1.577	.3702	1.663	.3927	1.573
.3240	1.557	.3489	1.578	.3705	1.642	.3931	1.584
.3243	1.559	.3493	1.590	.3709	1.636	.3934	1.620
.3247	1.532	.3499	1.579	.3714	1.650	.3939	1.629
.3271	1.656	.3502	1.586	.3718	1.669	.3943	1.629
.3276	1.646	.3506	1.600	.3721	1.671	.3946	1.623
.3279	1.666	.3509	1.625	.3725	1.654	.3950	1.634
.3286	1.658	.3531	1.624	.3729	1.665	.3967	1.588
.3289	1.677	.3534	1.645	.3733	1.685	.3971	1.613
.3293	1.696	.3538	1.639	.3736	1.716	.3974	1.608
.3296	1.717	.3541	1.640	.3740	1.726	.3978	1.598
.3302	1.715	.3547	1.648	.3760	1.715	.3983	1.587
.3305	1.714	.3551	1.621	.3763	1.717	.3986	1.583
.3309	1.706	.3554	1.618	.3767	1.731	.3990	1.584
.3312	1.715	.3558	1.630	.3770	1.741	.3993	1.592
.3335	1.658	.3562	1.669	.3776	1.722	.3999	1.568
.3338	1.635	.3565	1.662	.3780	1.721	.4002	1.550
.3342	1.645	.3569	1.672	.3783	1.720	.4006	1.537
.3345	1.640	.3572	1.646	.3787	1.708	.4009	1.533
.3350	1.620	.3577	1.600	.3791	1.695	.4014	1.539
.3354	1.623	.3580	1.589	.3795	1.723	.4018	1.540
.3357	1.616	.3584	1.597	.3798	1.729	.4021	1.547
.3361	1.639	.3587	1.557	.3802	1.700	.4025	1.545
.3366	1.586	.3591	1.619	.3830	1.693	.4044	1.542



Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.4047	1.540	.4264	1.495	.4501	1.602	.4716	1.589
.4051	1.535	.4268	1.477	.4505	1.586	.4720	1.569
.4054	1.558	.4271	1.492	.4510	1.579		
.4059	1.545	.4277	1.519	.4514	1.583	2446329.+	
.4063	1.557	.4281	1.490	.4517	1.598	.4650	1.573
.4066	1.550	.4286	1.514	.4521	1.595	.4654	1.553
.4070	1.557	.4307	1.511	.4525	1.579	.4657	1.538
.4074	1.545	.4311	1.505	.4529	1.601	.4661	1.494
.4078	1.533	.4314	1.464	.4532	1.582	.4664	1.533
.4081	1.555	.4318	1.464	.4536	1.559	.4668	1.555
.4085	1.575	.4323	1.463	.4541	1.544	.4671	1.542
.4089	1.563	.4326	1.491	.4544	1.576	.4675	1.516
.4093	1.579	.4330	1.487	.4548	1.586	.4678	1.509
.4096	1.570	.4333	1.523	.4551	1.586	.4682	1.529
.4100	1.546	.4340	1.506	.4579	1.561	.4685	1.533
.4119	1.474	.4344	1.531	.4583	1.559	.4689	1.530
.4123	1.471	.4347	1.529	.4586	1.566	.4692	1.533
.4126	1.468	.4350	1.547	.4590	1.601	.4696	1.542
.4130	1.460	.4356	1.542	.4596	1.588	.4699	1.537
.4134	1.449	.4359	1.494	.4599	1.575	.4703	1.534
.4137	1.432	.4363	1.484	.4603	1.558	.4706	1.546
.4141	1.437	.4366	1.484	.4606	1.537	.4710	1.556
.4144	1.437	.4373	1.554	.4610	1.550	.4713	1.541
.4165	1.471	.4376	1.547	.4614	1.557	.4717	1.567
.4168	1.463	.4380	1.550	.4617	1.554	.4720	1.560
.4172	1.473	.4383	1.547	.4621	1.535	.4723	1.561
.4175	1.464	.4409	1.456	.4646	1.493	.4727	1.578
.4180	1.502	.4412	1.455	.4650	1.497	.4730	1.586
.4183	1.500	.4416	1.482	.4653	1.483	.4734	1.566
.4187	1.468	.4419	1.472	.4656	1.501	.4737	1.560
.4190	1.449	.4425	1.473	.4662	1.534	.4741	1.527
.4196	1.449	.4429	1.493	.4666	1.500	.4744	1.530
.4200	1.487	.4432	1.502	.4669	1.527	.4748	1.530
.4203	1.477	.4436	1.522	.4673	1.564	.4751	1.541
.4207	1.535	.4441	1.517	.4678	1.602	.4755	1.580
.4230	1.551	.4445	1.510	.4682	1.562	.4758	1.574
.4233	1.558	.4448	1.484	.4685	1.508	.4762	1.571
.4237	1.571	.4452	1.467	.4685	1.519	.4765	1.569
.4240	1.564	.4458	1.467	.4694	1.540	.4769	1.576
.4245	1.538	.4462	1.454	.4697	1.569	.4772	1.552
.4248	1.518	.4465	1.443	.4700	1.583	.4776	1.555
.4252	1.492	.4469	1.481	.4704	1.596	.4779	1.566
.4255	1.508	.4494	1.600	.4709	1.586	.4782	1.578
.4261	1.508	.4498	1.617	.4713	1.581	.4786	1.582

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.4789	1.584	.5024	1.630	.5265	1.791	.5501	1.754
.4793	1.600	.5028	1.641	.5268	1.760	.5505	1.752
.4796	1.624	.5031	1.666	.5272	1.777	.5508	1.751
.4800	1.617	.5035	1.662	.5275	1.788	.5512	1.766
.4803	1.617	.5038	1.664	.5279	1.785	.5515	1.790
.4807	1.620	.5042	1.658	.5282	1.789	.5519	1.795
.4810	1.618	.5045	1.653	.5285	1.802	.5522	1.790
.4814	1.624	.5049	1.675	.5289	1.806	.5526	1.793
.4817	1.620	.5052	1.699	.5292	1.801	.5529	1.804
.4821	1.611	.5056	1.720	.5296	1.797	.5533	1.771
.4906	1.635	.5059	1.700	.5299	1.767	.5536	1.764
.4910	1.626	.5063	1.714	.5303	1.748	.5540	1.777
.4913	1.624	.5066	1.705	.5306	1.762	.5543	1.786
.4917	1.621	.5070	1.710	.5310	1.763	.5547	1.776
.4920	1.604	.5073	1.718	.5313	1.765	.5550	1.760
.4924	1.604	.5077	1.728	.5317	1.773	.5554	1.782
.4927	1.643	.5167	1.738	.5320	1.777	.5557	1.809
.4931	1.650	.5171	1.757	.5324	1.783	.5560	1.803
.4934	1.634	.5174	1.743	.5327	1.791	.5564	1.798
.4938	1.621	.5178	1.729	.5331	1.793	.5567	1.756
.4941	1.599	.5181	1.726	.5334	1.791	.5571	1.743
.4945	1.609	.5185	1.744	.5338	1.787	.5574	1.702
.4948	1.602	.5188	1.754	.5415	1.786	.5578	1.681
.4951	1.621	.5192	1.751	.5418	1.798	.5581	1.684
.4955	1.634	.5195	1.764	.5428	1.792	.5585	1.702
.4958	1.647	.5199	1.757	.5435	1.808	.5675	1.754
.4962	1.652	.5202	1.775	.5439	1.836	.5678	1.769
.4965	1.669	.5206	1.786	.5442	1.846	.5682	1.785
.4969	1.671	.5209	1.800	.5446	1.844	.5685	1.784
.4972	1.661	.5212	1.818	.5449	1.832	.5689	1.794
.4976	1.659	.5216	1.813	.5453	1.843	.5692	1.766
.4979	1.657	.5219	1.817	.5456	1.810	.5696	1.753
.4983	1.670	.5223	1.800	.5460	1.813	.5699	1.738
.4986	1.661	.5226	1.779	.5463	1.811	.5703	1.725
.4990	1.665	.5230	1.731	.5467	1.812	.5706	1.708
.4993	1.697	.5233	1.696	.5470	1.813	.5709	1.696
.4997	1.714	.5237	1.709	.5474	1.774	.5713	1.663
.5000	1.701	.5240	1.689	.5477	1.754	.5716	1.639
.5004	1.706	.5244	1.736	.5481	1.733	.5720	1.647
.5007	1.703	.5247	1.762	.5484	1.729	.5723	1.681
.5010	1.687	.5251	1.811	.5487	1.743	.5727	1.722
.5014	1.679	.5254	1.787	.5491	1.747	.5730	1.737
.5017	1.665	.5258	1.803	.5494	1.745	.5734	1.742
.5021	1.652	.5261	1.797	.5498	1.756	.5737	1.756

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.5741	1.747	.5964	1.729	.6191	1.587	.5590	1.621
.5744	1.731	.5968	1.715	.6194	1.556	.5593	1.646
.5748	1.751	.5971	1.683	.6198	1.543	.5596	1.650
.5751	1.740	.5974	1.679	.6201	1.556	.5600	1.636
.5755	1.725	.5978	1.666	.6205	1.582	.5603	1.633
.5758	1.730	.5981	1.669	.6208	1.598	.5607	1.646
.5762	1.720	.5985	1.666	.6212	1.617	.5610	1.645
.5765	1.709	.5988	1.646	.6215	1.635	.5614	1.663
.5769	1.722	.5992	1.674	.6219	1.640	.5617	1.663
.5772	1.725	.5995	1.682	.6222	1.646	.5621	1.650
.5776	1.746	.5999	1.670	.6226	1.655	.5624	1.636
.5779	1.745	.6002	1.663	.6229	1.650	.5628	1.647
.5782	1.761	.6006	1.650	.6233	1.646	.5631	1.674
.5786	1.750	.6009	1.650	.6236	1.631	.5635	1.718
.5789	1.744	.6013	1.644	.6240	1.591	.5638	1.724
.5793	1.743	.6016	1.643	.6243	1.582	.5642	1.723
.5796	1.733	.6020	1.646	.6246	1.593	.5645	1.704
.5800	1.719	.6023	1.653	.6250	1.574	.5649	1.702
.5803	1.734	.6027	1.655	.6253	1.614	.5652	1.714
.5807	1.700	.6030	1.649	.6257	1.604	.5655	1.721
.5810	1.713	.6034	1.676	.6260	1.611	.5659	1.709
.5814	1.716	.6037	1.673	.6264	1.639	.5830	1.608
.5817	1.692	.6041	1.658	.6267	1.650	.5833	1.635
.5821	1.696	.6044	1.680	.6271	1.634	.5837	1.627
.5824	1.701	.6048	1.689	.6274	1.629	.5840	1.628
.5828	1.679	.6051	1.684	.6278	1.622	.5844	1.620
.5831	1.679	.6054	1.674	.6281	1.610	.5847	1.651
.5835	1.704	.6058	1.668	.6285	1.587	.5851	1.678
.5838	1.717	.6061	1.664	.6288	1.582	.5854	1.661
.5842	1.727	.6065	1.667			.5858	1.662
.5845	1.723	.6068	1.635	2446359.+		.5861	1.686
.5919	1.692	.6072	1.631	.5544	1.709	.5865	1.699
.5922	1.698	.6075	1.635	.5548	1.702	.5868	1.713
.5926	1.690	.6079	1.641	.5551	1.703	.5872	1.715
.5929	1.688	.6082	1.635	.5555	1.704	.5875	1.718
.5933	1.719	.6086	1.588	.5558	1.681	.5879	1.711
.5936	1.711	.6089	1.592	.5562	1.680	.5882	1.715
.5940	1.729	.6167	1.622	.5565	1.648	.5885	1.698
.5943	1.747	.6170	1.612	.5569	1.619	.5889	1.702
.5947	1.755	.6174	1.598	.5572	1.630	.5892	1.703
.5950	1.745	.6177	1.612	.5576	1.636	.5896	1.708
.5954	1.730	.6181	1.595	.5579	1.648	.5899	1.697
.5957	1.707	.6184	1.588	.5583	1.632	.5903	1.687
.5961	1.722	.6187	1.585	.5586	1.630	.5906	1.667

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.5910	1.642	.6154	1.596	.6411	1.532	.4404	1.486
.5913	1.637	.6158	1.601	.6415	1.563	.4407	1.434
.5917	1.638	.6161	1.589	.6418	1.583	.4411	1.450
.5920	1.601	.6165	1.585	.6422	1.626	.4414	1.426
.5924	1.606	.6168	1.576	.6425	1.628	.4418	1.442
.5927	1.623	.6172	1.531	.6429	1.644	.4421	1.443
.5931	1.639	.6175	1.554	.6432	1.652	.4425	1.488
.5934	1.651	.6179	1.557	.6436	1.615	.4428	1.479
.5938	1.647	.6182	1.579	.6439	1.607	.4432	1.501
.5941	1.648	.6185	1.600	.6443	1.596	.4435	1.528
.5944	1.740	.6189	1.610	.6446	1.612	.4439	1.492
.5948	1.769	.6192	1.584	.6450	1.627	.4442	1.483
.5951	1.698	.6196	1.601			.4445	1.485
.5955	1.616	.6199	1.625	2446412.+		.4449	1.459
.5958	1.629	.6203	1.633	.4289	1.514	.4452	1.438
.5962	1.618	.6206	1.628	.4293	1.532	.4456	1.467
.5965	1.591	.6210	1.638	.4296	1.530	.4459	1.493
.5969	1.609	.6213	1.644	.4300	1.527	.4564	1.599
.5972	1.616	.6217	1.642	.4303	1.585	.4568	1.592
.5976	1.632	.6220	1.646	.4306	1.559	.4571	1.596
.5979	1.625	.6224	1.644	.4310	1.585	.4575	1.578
.5983	1.634	.6227	1.646	.4313	1.569	.4578	1.577
.5986	1.625	.6231	1.635	.4317	1.562	.4582	1.550
.5990	1.651	.6234	1.653	.4320	1.550	.4585	1.532
.5993	1.621	.6238	1.641	.4324	1.549	.4589	1.546
.5997	1.621	.6241	1.636	.4327	1.544	.4592	1.523
.6000	1.632	.6244	1.646	.4331	1.536	.4596	1.496
.6095	1.633	.6248	1.629	.4334	1.515	.4599	1.519
.6099	1.621	.6251	1.602	.4338	1.523	.4603	1.494
.6102	1.598	.6255	1.593	.4341	1.537	.4606	1.475
.6106	1.591	.6258	1.600	.4355	1.532	.4610	1.490
.6109	1.590	.6262	1.600	.4359	1.499	.4613	1.533
.6113	1.583	.6265	1.569	.4362	1.489	.4617	1.565
.6116	1.572	.6373	1.569	.4366	1.462	.4620	1.589
.6119	1.593	.6377	1.559	.4369	1.468	.4623	1.560
.6123	1.624	.6380	1.570	.4373	1.475	.4627	1.521
.6126	1.606	.6384	1.587	.4376	1.443	.4631	1.513
.6130	1.566	.6387	1.577	.4379	1.414	.4634	1.531
.6133	1.584	.6391	1.565	.4383	1.446	.4637	1.529
.6137	1.576	.6394	1.559	.4386	1.466	.4641	1.506
.6140	1.600	.6397	1.510	.4390	1.443	.4644	1.554
.6144	1.624	.6401	1.520	.4393	1.426	.4648	1.552
.6147	1.666	.6404	1.529	.4397	1.452	.4651	1.540
.6151	1.681	.6408	1.526	.4400	1.487	.4655	1.511

Table 1. - continued

J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$	J.D. hel	$\Delta B$
.4658	1.522	.4728	1.550	.4904	1.650	.4966	1.701
.4662	1.534	.4731	1.540	.4907	1.666	.4970	1.764
.4665	1.528	.4735	1.516	.4911	1.640	.4973	1.713
.4669	1.540	.4852	1.638	.4914	1.646	.4977	1.678
.4672	1.561	.4855	1.632	.4918	1.661	.4980	1.674
.4676	1.582	.4859	1.637	.4921	1.676	.4984	1.658
.4686	1.550	.4862	1.637	.4925	1.652	.4987	1.703
.4690	1.530	.4866	1.638	.4928	1.646	.4991	1.739
.4693	1.520	.4869	1.666	.4932	1.623	.4994	1.726
.4697	1.498	.4873	1.629	.4935	1.626	.4998	1.699
.4700	1.478	.4876	1.643	.4939	1.625	.5001	1.719
.4703	1.520	.4879	1.661	.4942	1.659	.5004	1.742
.4707	1.546	.4883	1.636	.4945	1.648	.5008	1.715
.4710	1.527	.4886	1.655	.4949	1.662	.5011	1.693
.4714	1.536	.4890	1.683	.4952	1.683	.5015	1.711
.4717	1.537	.4893	1.675	.4956	1.713	.5018	1.741
.4721	1.523	.4897	1.714	.4959	1.730	.5022	1.754
.4724	1.550	.4900	1.700	.4963	1.727		

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